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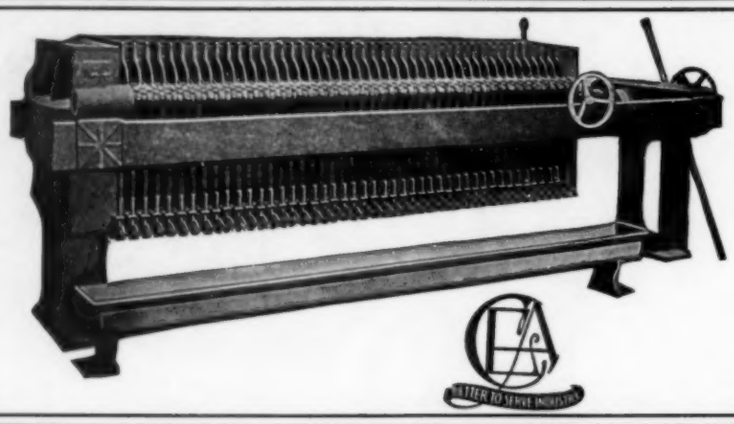

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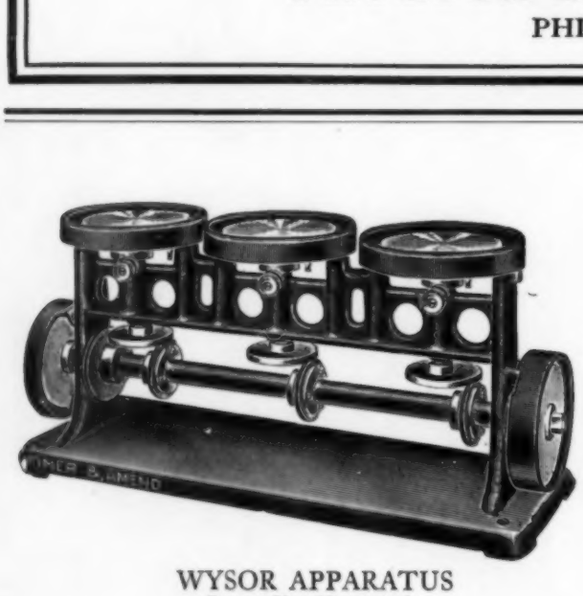

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H. C. PARMELEE, Editor

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Conference on Immigration

IMMIGRATION is one of the most important domestic problems that will come before Congress in its next session. The present law, which regulates the influx of aliens on a percentage basis, will expire by statutory limitation on June 30, 1924, and new legislation must be enacted before that time. In an effort to aid in formulating an intelligent immigration program for the United States the National Industrial Conference Board has called a national immigration conference at the Hotel Astor in New York City on Dec. 13 and 14. The conference will be opened with a statement of the major aspects of the immigration problem, following which there will be a program of discussion. Considering the importance of immigration to industry in the United States, this conference should afford an opportunity for formulating basic principles on which future legislation should be based. Is the present immigration act satisfactory? If not, how shall it be amended? Shall we continue on the percentage basis or shall we go further and take steps to insure better selection at the source and more effective distribution in this country? Shall we enact legislation blindly or shall we first make investigation of the whole subject and then draft a law intelligently? The chemical engineering industries are not largely dependent upon labor for their success, but they have nevertheless a vital interest in any program that the government may adopt. Consequently we urge upon those who have opinions on the subject to attend this conference, where the fullest consideration will be given their views.

The Value of Background and Experience

THE entire staff of *Chem. & Met.* had been wiped out! Every one of our colleagues—from office boy to publisher—was gone and men from the street had been called in to fill our places. This was the appalling situation that confronted us in a dream the other night and in a subconscious sort of way we seemed to enjoy it immensely. We kept wondering what would happen next. Would the Anti-Saloon League or the A. F. of L. dictate the editorial policy? Would chemical engineering give way to politics or bolshevism? Would the advertising columns be filled with patent medicine fakes or wildcat promotions?

With somewhat the same sort of attitude we have watched certain developments that have occurred during the past few years in some of our chemical engineering industries. We have watched (though not without protest) the heads of great corporations when with one red mark across the budget sheet they have wiped out the entire technical staff of a research department or with a furious reorganization policy they have disemboweled a production unit. When the temporary business depression gave way to more active trading, we have watched the places of the research men being filled with youths just out of college while men from the street, the garage or the steel works have been called in to operate chemical engineering processes. Many times we have caught ourselves wondering what would happen next.

Lately some serious things have been happening. Disastrous fires and explosions have been occurring much too frequently in our industries. Can it be that this is the toll for somebody's shortsightedness? Is it because inexperienced men have in emergencies failed to measure up to the responsibilities of chemical plant operation? Is it because the great fund of technical knowledge and experience, painfully accumulated during and since the war, has been scattered to the four winds?

When we read between the lines of the brief news accounts of these tragedies we seem to see a connection with these other things that have gone before. We have the feeling that, costly as it may be in life and property, somebody is learning a lesson. A background of operating experience is one of the things that is built up by and among the technical men in the plant. It is an invaluable asset that no corporation—no matter how great or powerful—can ever afford to throw into the discard.

Business Reacts Favorably To Proposal for Tax Reduction

NOT in a blue moon has a public issue been so strategically presented as Secretary Mellon's proposal for tax reduction. Taxation now holds the center of the stage and it is likely to play the leading rôle in the business drama until the curtain falls on the next Congress. The soldier bonus is relegated to the wings with little prospect of a second appearance even though a vociferous claque still simulates spontaneous demand for a curtain call. Pin money for able-bodied men never was a great and vital issue save in its political aspect, but it pales into insignificance compared with the tremendous industrial consequences of intelligent tax revision.

In the completeness and detail of his proposals, Secretary Mellon was as disconcerting to the politicians as he was refreshing to business men. His was no vague and uncertain plan calling for tax reduction as an abstract principle. He expressed it in concrete figures so that the man in the street could visualize his

lowered taxes in terms of a new overcoat or a life insurance premium. He proposed surtax rates which, while lower than those now prevailing, will nevertheless yield a bigger return to the Treasury. He offered a plan to discriminate between earned and unearned income in such a way as to encourage the flow of capital into productive industries. On the whole the Secretary offered the country the best business tonic it has had in many a day.

The instant and almost unanimous favor with which business and industry throughout the country received Secretary Mellon's proposals showed that he had struck a responsive chord. Even politicians and members of Congress who at first scouted the idea of tax revision at this session finally found it expedient to fall into line, even though they felt uncomfortable and embarrassed over their political desire for the so-called adjusted compensation for veterans of the World War. Each day since the Secretary broached his plan has brought its flood of public approval from industrial leaders and commercial organizations. Tax reduction is recognized as an immediate industrial stimulant as well as a relief for the average individual who has seen too many of his dollars flow into the Treasury. "In this world nothing is certain but death and taxes," wrote Franklin to M. Leroy in 1789, and since death is not imminent we may take some satisfaction in the thought that taxes, though certain, are likely to be less onerous.

Do You Need A Chemist?

IN NEW YORK CITY the Chemists' Club maintains an employment bureau that for a number of years has been doing a worth-while work for industry. Its national reputation among technical men is borne out by the fact that on Nov. 1 there were 1,250 names on the active list of registrants. Unfortunately, however, the bureau is not so well known to our industries—a fact that naturally limits the scope of its usefulness.

During the war, when the demand for chemists exceeded the supply, the agency was able to support itself entirely from the small fees paid by the men who obtained positions. Now that the pendulum has swung in the opposite direction the bureau has been forced to draw upon the club's treasury for a part of its funds. While there is no indication that the parent organization is unwilling to continue to make its contribution to the welfare of the chemical profession, it is nevertheless apparent that a subsidy would not be necessary if those who employ chemists would make greater use of this source of supply.

It is evident from some of the demands that come to the bureau that there is misunderstanding among some employers regarding the purpose and scope of the service. Many appear to believe that every one whose name is on the list is at present unemployed and therefore of necessity forced to accept employment at ridiculously low salaries or under severest restrictions. As a matter of fact, less than half are unemployed; most have registered with the intention and ambition to improve their own economic status.

Another evident tendency is the preference being shown to recent graduates and low-salaried employees at a time when there is no market for the more experienced chemist who has been out of school 5 or 10 years and asks for recompense commensurate with his worth. To the employers that are responsible for this condition, a note of warning is perhaps in order. There is an old saw about "sending a boy to do a man's work" and in no industry is it of more patent application. We would be the last to discourage the young fellow who is anxious to get out and make his mark, but oftentimes it is the better part of wisdom for the manufacturer to employ a man a little farther along in years and with a little more of the background of experience on which to build.

To be sure, the manufacturer is not entirely to blame for the one-sided development of the employment service. Much is at fault with the applicant and his method of selling his services. His demands are often unreasonable, he is too inflexible in his makeup, and he is inexperienced in business matters. The prime need is for the co-operation of both parties. The Chemists' Club bureau of employment is a valuable adjunct to industry just in the proportion that employer and employed are willing to take advantage of its service. We urge both to use it intelligently.

Bleaching Technology Takes a New Tack

THERE is little doubt that the thick bleaching system has come to stay in the pulp industry. Apparently the principle of bleaching at high densities has much to commend it in practice as well as in theory. The first installation in the world for bleaching by this process was put in operation 2 years ago at Newton Falls, N. Y. The results that have been obtained there are recorded in this issue. The facts indicate that during its period of tryout the system has justified its use; that it constitutes an advance of promising possibilities in the production of pulp.

A desirable reduction in the labor of preparing wood for chipping and digestion is made possible by the increased intensity of the bleaching action. This is sufficiently strong to take out bark particles and other organic dirt without difficulty. The use of a more dilute hypochlorite solution actually gives a greater concentration of available chlorine due to the removal of the excess water from the pulp before reaching the bleacher. Because of this increased intensity of action, the time required for the operation is materially reduced. Taking out the excess water also makes possible more economical use of bleach liquor and of heat. Shrinkage is found to be less than in other practice. A very desirable characteristic of the new system is the hydrating effect of the helical screws upon the pulp.

It is unfortunate that the story may not end here. As always, for every action, there is a corresponding reaction. The very factor that decreases the time of bleaching necessitates accurate control of the operation. The velocity of the bleaching action is so great that a difficulty arises in producing a uniform, properly bleached pulp. Intelligent manipulation is indispensable if the natural advantages of the process are to be realized. Moreover, the handling of a fibrous material of high density gives rise to a difficult mechanical problem, solved, it is true, in the type of equipment now available, but only at the expense of simplicity of design. Granted, however, that the proper care is exercised in operation, the new system measures

up well with older methods. Although prophecy is dangerous, we expect to find the thick bleaching idea taking a strong hold upon the industry as it further proves itself.

Mechanical Appliances vs. Manual Labor in Chile

WE ACCEPT the graceful compliment paid us by one of Santiago's leading newspapers, *El Mercurio*, in translating and reprinting in full an editorial that appeared in a recent issue of *Chem. & Met.* on American participation in the natural nitrate industry. We cannot ignore the prospects or evade the consequences of improved technical methods on the pampa, and for this reason we are inclined to comment on a notice that appeared in the same issue of our esteemed contemporary in which attention was drawn to the increasing scarcity of labor at the oficinas. We suggest that *El Mercurio* may again fulfill its mission in serving Chile and the nitrate industry by broadcasting the statement that the utilization of human labor, to the extent in evidence on the pampa today, is illogical. Mechanical appliances have been perfected for most of the arduous and disagreeable tasks now being performed by Chileans, who could, under more normal conditions, be then spared for work in which their mechanical aptitude as well as their muscles would be utilized.

Revolutionary changes are needed. The average charge of caliche treated is about 90 tons, and the unit of this size has been retained because of a mistaken idea that steam coils in contact with the caliche and the liquor are necessary. Recent developments have shown that the external heating of solution is preferable; in fact, the steam coils in the vat are the cause of channeling, imperfect extraction and many other disadvantages that add to the general inefficiency of operation. The work of the *derripiadores*, or picked laborers who strip to the waist to shovel, in a hot and steamy atmosphere, the sloppy tailing and the liquid *borra* through the bottom doors, must be seen to be appreciated. The filthy conditions obtaining during discharge in and underneath the cachuchos in an ordinary oficina are such that no surprise need be expressed at the absence of reliable data on nitrate loss during treatment.

It is stupid to put human beings to work of this character in these enlightened times. Steam coils are unnecessary in a vat that is properly designed for the efficient extraction of nitrate from caliche; bottom discharge doors inhibit the insulation of the vat, heighten the expense of treatment and prevent the utilization of cheap methods for the removal of residue from a charge of proper composition and adequate size. Sooner or later the Chilean nitrate industry will realize the fundamental importance of large-scale operations.

The mechanically operated grab bucket is particularly well suited for the removal of residue from leaching vats, and its adoption for this purpose in nitrate oficinas is only a matter of time. No urgent need for the reduction of costs may be apparent while comparatively high-grade caliche is available and so long as the synthetic nitrate industry does not constitute a serious competitor; but economy of man power should be recognized as desirable now, and inevitable later. Attention to this important question cannot be deferred indefinitely. The Chilean worker is second to none in intelligence; this fact has been recognized by the directors of other industries in the republic who have kept abreast of the times and have cheapened production by utilizing mechanical equipment to the full, all of which can be operated efficiently by Chileans. So long as the nitrate industry insists on stunting the intelligence of its employees, by keeping them at arduous and disagreeable tasks that can be performed better and more cheaply by machine, it is absurd to talk of a labor shortage.

The Motion Picture As an Aid to Research

THEORETICAL details of many mechanical operations that constitute the essential phases of chemical engineering processes have long remained matters for conjecture and dispute. This is particularly true in regard to the operation and motion of grinding media in mills that are inclosed, making visual observation difficult or impossible. Furthermore, the human eye, although able to register the picture of an instantaneous action, is incapable of following the many steps that make up that action, or of grasping fully the changes that occur in minute intervals of time. In such event the motion picture camera may be used to register each successive movement, the timing of projection being arranged according to the effect desired.

In this connection it is interesting to note the remarkable work being done by Prof. H. E. T. Haultain and associates at Toronto University, the results of whose researches to date, crystallized in the form of a series of motion pictures, provide ample food for thought. Slow-motion projection of photographs of a glass-sided cylindrical mill in action show that one commonly accepted mathematical conception of the operation is at fault—that the balls travel up the side of the mill at a uniform rate of speed, then make a parabolic descent to the liner at the bottom, leaving a space between the paths of elevation and fall. At normal rates of speed the motion picture shows that all the balls are in contact with one another in every part of the charge; no space exists between the rising column and the falling column. In fact, near the center of the mass there appears to be an inactive zone, where little movement of the media is observable. It is also interesting to note that a distinct segregation of the smaller balls occurs in this central zone. This action, although inexplicable, aids in the efficient operation of the mill. Outside the inactive zone the rubbing of ball on ball is apparent, emphasizing the logic of stressing abrasive grinding as the dominant action in the mill.

Since the tube mill was borrowed from the cement industry in 1895 for the grinding of sulphotelluride gold ore it has undergone only minor modifications in design, but the necessity for operating wet has deflected attention to many efficiency factors and suggested experimentation and research; these include ball load, speed of mill in relation to diameter, moisture content and volume of pulp. Most of the problems involved have been solved satisfactorily, and it is believed that the experiments now being made at Toronto University will throw fresh light on the subject of the scope of such a machine for the pulverization of a great variety of mineral and chemical products.

A Summit of Distinction

The Great Prestige of the Nobel Prizes Has Made the Physics Award to Robert Andrews Millikan an Event of National Significance

WHEN Albert Nobel established an endowment fund to give prizes to those who had advanced human knowledge in its various branches, he may have dreamed that the prizes would be held in high esteem. A prize of $40,000 is apt to be held in high esteem even by those who have segregated themselves from worldly things.

But that is not the whole story. The faulty or prejudiced award of the prize would soon let it fall into disrepute. The Nobel laureates have been well chosen. It is not unnatural that the literature prizes should have a preponderant Scandinavian cast, for literature is a difficult thing to evaluate in terms of human benefit beyond the limits of one's native language. Similarly the peace prizes might logically find more candidates in those countries that are more frequently at war—i.e., Europe, with its turbulent borders.

In chemistry, physics and medicine those selected have invariably been international figures of whom one familiar with the field could say, "Of course, he has done so and so." Van't Hoff, Fischer, Arrhenius, Baeyer, Ramsay, Moissan, Curie, Sabatier, Richards, Haber, Nernst, Soddy, Aston, in chemistry; every name stands for achievement. So it is also in physics, with Roentgen, Lorentz, Becquerel, Rayleigh, Thomson, Van der Waals and Bragg.

The latest Nobel laureate in physics, Robert Andrews Millikan, is the seventh American to receive a Nobel award. Theodore Roosevelt, Elihu Root and Woodrow Wilson have each received the peace prize. Alexis Carrel, the famous head of the Rockefeller Institute, was awarded the prize in medicine.

R. A. Millikan

Nobel Laureate in Physics

Theodore Richards of Harvard was honored with the chemistry prize for his magnificent work on atomic weights, and A. A. Michelson of Chicago received the award in physics nearly 20 years ago.

Professor Millikan was for nearly a quarter of a century a member of the department of physics at the University of Chicago and only 2 years ago accepted the appointment as Norman Bridge professor of physics at the California Institute of Technology at Pasadena. Honorary degrees from Oberlin, Northwestern, Pennsylvania, Columbia and Dublin are merely an indication of his distinguished position in the scientific world.

Have you ever heard Millikan talk on the nature of matter, the composition and structure of atoms? To hear him is a rare privilege, for he is at once a pioneer who has blazed the trail and an eager student whose imagination has been fired by the romance of the subject. That fire is contagious and is being passed on to coming generations of pioneers in physical research.

It was his brilliant experimental work leading to the isolation and identification of the electron that won for him the Nobel award. His personality and achievement have enriched American scientific tradition and his vitality gives promise of still greater advance.

Operating the First Unit for

Thick Bleaching Sulphite Pulp

Description of Bleaching Practice at the Mill of the Newton Falls Paper Co., Where the Thick Bleaching System Has Been in Operation for Two Years—Discussion of Practical Details of Operating Technique

By Harold J. Payne
Of the Editorial Staff of *Chem. & Met.*

IN A previous article the technique and procedure involved in producing sulphite pulp were described and the refining of the pulp was carried to the point at which the bleaching process begins. Here the method employed at Newton Falls is unique—the thick bleaching system being used. It is the purpose of this article to point out the advantages and disadvantages of this process, indicating what results may be expected from this development in pulp mill practice. Good management dictates that the required liquor for bleaching be produced at a minimum cost. Some question exists as to whether it is better to chlorinate bleaching powder solution up to the strength which it is desired to use (about 30 grams Cl per liter) or to produce the solution of calcium hypochlorite directly by allowing hydrated lime to react with chlorine under the conditions suitable for the production of the bleach. Both methods are used at the plant of the Newton Falls Paper Co., and with the market normal the cost of materials is very close to constant whichever method is employed. The chlorine-lime method, however, is superior in that there is a lower sludge loss and in that it involves a lower labor cost. Operation is also simpler, because in order to insure getting out a maximum of the chlorine in the bleaching powder it is necessary to use some sort of counter-current extraction before running the solution through the absorption tower to build up its chlorine content.

The system followed mainly at present is the direct production from chemical or hydrated lime, which comes into the plant in bags, and from chlorine, which comes in liquid form in tank cars. The manufacture of the bleach is a batch process carried out in one of two tanks, each holding 5,000 gal. These tanks are so arranged that their contents may be circulated through the chlorine absorption tower by a small pump. To make up a batch, lime and chlorine are added in the ratio of 1 to 1.22 by weight. The lime is added first in the tank and is agitated until it is fairly well mixed through the water. Circulation through the tower shown in Fig. 1 then begins. The chlorine, manufactured electrolytically at Niagara Falls and shipped to the plant in tank cars, comes into the cylinder shown beside the tower under its own pressure from the car. Heat is applied to the coil around the cylinder, while the main leading to the top of the tower is opened. The main or header runs down into the tower part way, so that as the gas escapes and flows out it comes into intimate contact with the solution flowing down through the tower. When the solution is no longer alkaline the circulation, of course, is stopped. The tower itself is packed with circular tile blocks, staggered in order to insure a large surface for contact of the liquor with the gas. Its dimensions are roughly 3.5 ft. inside diameter and 18 ft. high. As is shown in the illustration, ordinary glazed sewer tile is used in its construction. That it is efficient is evidenced by the fact that the net loss of Cl from tank car to finished bleach seldom runs over 0.4 per cent. This system is operated at a temperature of about 70 deg. F. in winter and 80 deg. F. in summer. The time required for bringing the bleach up to strength varies from about 2½ hours in winter to 1¾ hours in summer. Having completed the chlorination, the solution is allowed to settle about 3 hours in order to retain as much lime as possible in this tank to be re-used in the next batch. After settling the solution, it is flowed by gravity into one of two large storage tanks holding around 14,000 gal. each. Here further opportunity is given any sludge still present to separate out. Then, after staying in these tanks an hour and a half or so, the solution is pumped over to a sand filter placed directly above the bleach storage tanks that feed the bleachers themselves by gravity. The last particles of solid suspended matter are removed here in order to insure freedom from lime in the bleachers, the presence of which constitutes a troublesome contamination.

The process of whitening the fiber as it comes from the screens is primarily one of oxidation under carefully controlled conditions. The yellow coloring, organic in composition, is not well understood. What is known is that it constitutes a reducing agent of varying degrees of strength. It is by allowing the oxygen released by the action of calcium hypochlorite and water in the bleaching process to react with this coloring

In the usual sulphite pulp bleaching system, the low concentration of fiber makes necessary an excess of the bleach liquor. In addition to this, a relatively long period of agitation and a considerable quantity of heat are necessary. In order to overcome these difficulties, this so-called thick system was developed. Two years of operation of the first installation described in this article has indicated genuine possibilities in the new process.

matter that a colorless compound results, which can be eliminated in subsequent washing.

In the past several methods for carrying out the bleaching operation have been developed. The essential difference among the various methods was the manner in which the bleach and the pulp were brought together and circulated. The most popular system in operation in this country is known as the Bellmer system. The Bellmers are large tanks, usually with tile lining. They are shaped like an overgrown wash boiler with one end cut off squarely. One or two partitions run from the square end nearly to the opposite end. The pulp concentration as handled in Bellmers usually varies between 5 and 6 per cent. This pulp is circulated by a screw conveyor at the square end, which carries it from one side of the partition to the other at the base of the tank. In the more modern installations the bleach is added with the pulp and the total time of bleaching averages 8 hours.

The Wolf thick bleaching system is employed at Newton Falls. Although new installations are now being

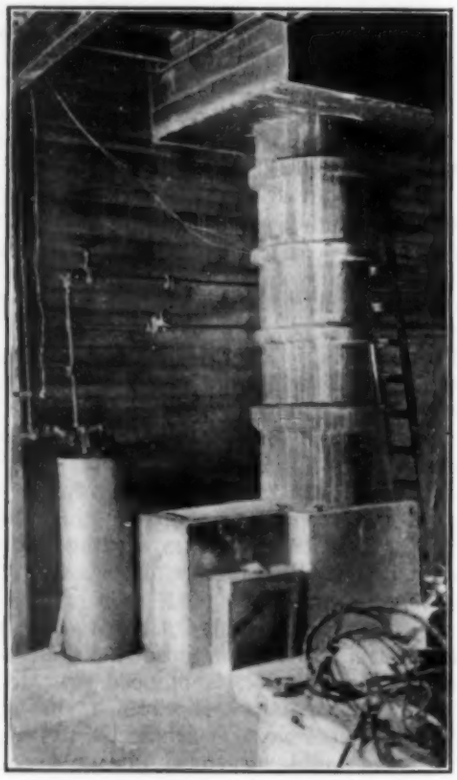

Fig. 1—Bleach Absorption Tower

made for 2½ years this installation has claimed the distinction of being unique in that it was the only one of its kind in existence. Certain principles are involved here that are theoretically more nearly ideal than those applying to the Bellmer system.

The pulp coming from the refining screens through the Woods machine is pumped to two wet machines the function of which is to dry the pulp until it carries about 28 per cent air dry fiber. These machines are shown in Fig. 2. These deliver the pulp continuously to a helical conveyor (Fig. 3), which feeds any one of the battery of three bleachers. Most of the bleach is added as the pulp drops to the conveyor, with the result that as the pulp goes into the bleacher the bleaching solution has already begun to become incorporated and the

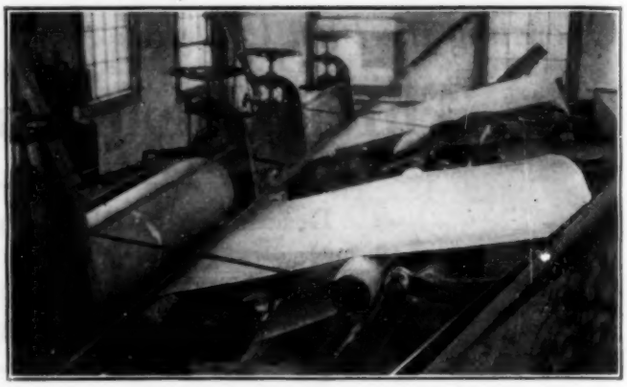

Fig. 2—Taking Water Out of Pulp

action of whitening is well under way. Any necessary additions of bleach or water are readily made to the tank itself. One of the greatest advantages of this system is the reduced time required for carrying out the operation. A time of not over 3 hours is required to fill one tank holding 3¼ tons of air-dry pulp. The bleaching itself seldom takes over 3 hours in addition and is sometimes complete in less than 2 hours. The actual fiber consistency during bleaching runs from 18 to 22 per cent air-dry pulp. Needless to say, the construction of tanks for circulating fibrous material of this composition is unusual. The problem of mixing and agitating involved here is a difficult one. The action of bleaching is a sort of digestion also—a low-temperature, accurately controlled digestion. The range of temperature permissible, the consistency of the stock, the strength of the bleach, the nature of the pulp, all play a part in determining the control of this digestion.

Construction of Tanks

The construction and operation of the tanks is shown in the sketches, Figs. 4, 5 and 6. It will be seen that they are relatively long and narrow, that each is divided into two lateral sections and that there are six helical screws in each. In each lateral section there are two screws running lengthwise, while at each end there is one screw running crosswise carrying the pulp from one compartment to the next. The construction is of concrete with tile facing inside to increase cleanliness, to prevent attack by the bleach and to decrease friction.

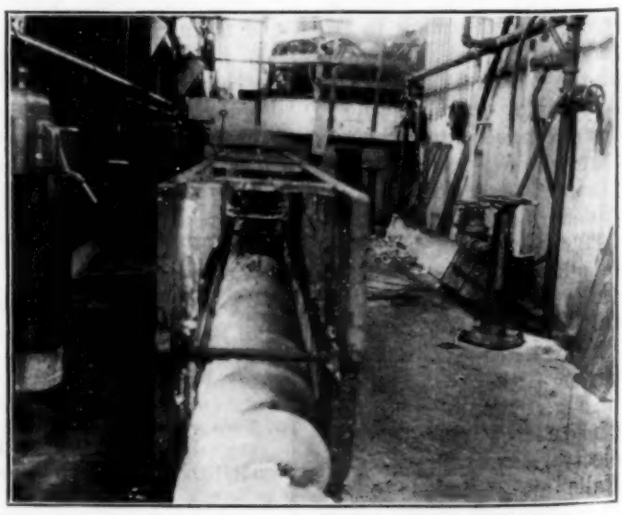

Fig. 3—Helical Conveyor Carrying Pulp to Bleachers

Due to the large size of screws, special thrust bearings and packing arrangements have been found necessary. A total power consumption of about 58 hp. when running full is required. Motors of 75 hp. are now employed on each, but it is planned to reduce these to 50 hp. and to carry an overload when running with the bleacher full. While the power input is large, the repairs and upkeep of this installation have been found to be slight.

The factors controlling bleaching operation are no different here than they are in any other practice. Temperature, consistency and strength of bleach determine largely what results will be obtained. Due to the addition of the bleach to the stock before it reaches the bleachers, the time is cut to a point where conditions have to be controlled very carefully if satisfactory results are to be obtained. Temperature is regarded as being most important in this respect. In winter steam is added in small quantities at the start to bring the temperature up to about 70 deg. F. No harmful effects are noted from this procedure, as might be expected. The heat of reaction is sufficient to raise the temperature about 15 deg. further. Hence the actual range of bleaching temperatures is from 70 to 85 deg. It is most essential in this process to keep the temperature within a low limit, say 95 deg. F.

Because of the denser stock it is possible to make use of a more diluted bleach. An economy in the use of bleach results, because it is possible to use a very low excess in safety. It is thought that the use of this combination gives a better yield and a better fiber under properly controlled conditions than do other systems in which it is practice to use a stock carrying more water along with a stronger bleach. During the time of treatment in this type of bleacher the action of the helical conveyors gives something of a hydrating effect, with the result that the strength of fiber is increased up to 10 per cent above its entering strength. Because of the relatively greater ease of carrying out the bleaching action under these conditions, it is possible to bleach out specks and dirt, which would cause much difficulty in most systems. It is common practice here to be deliberately more careless from woodroom right up to the bleachers, because it has been found that practically anything but inorganic dirt can be taken out at this point without excessive additions of bleach and without using an excessively long time for bleaching. It is inevitable that there should be considerable variation in the bleaching time required and that if an extra dirty pulp comes through a poorer product will result.

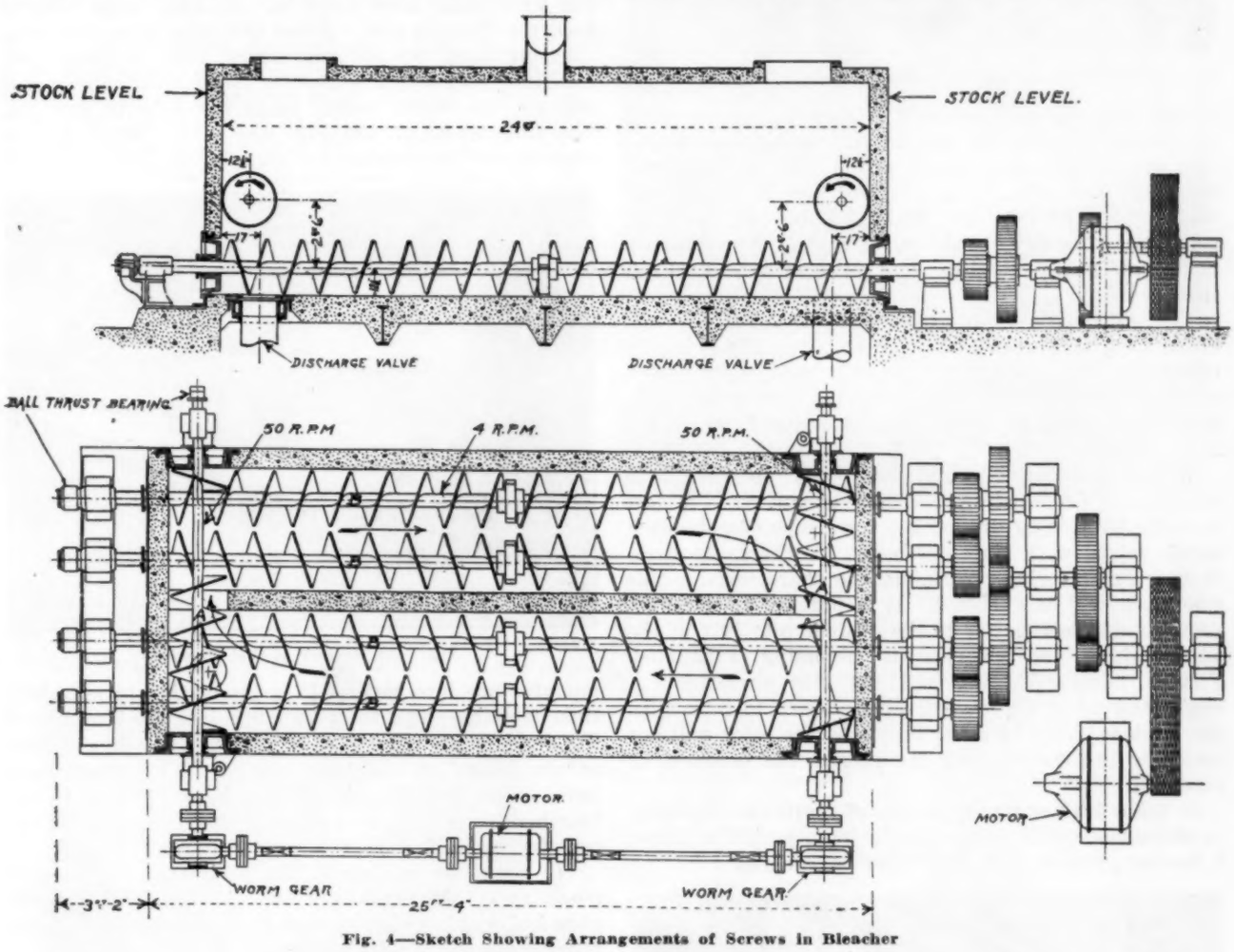

Fig. 4—Sketch Showing Arrangements of Screws in Bleacher

Easy bleaching and hard bleaching stock require special treatment, and it is for this reason that this process has to be controlled so carefully. The variation of time is much less than in a system where the whole operation is carried out in far more dilute solution. The permanganate method of ascertaining the amount of oxidation required is resorted to when trouble is encountered or when the stock coming through is varying widely in respect to its ease of bleaching. If this

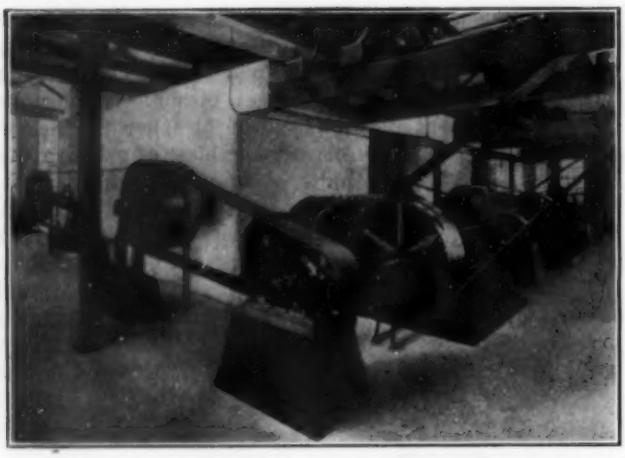

Fig. 5—Front View of Bleaching Tanks Showing Thrust Bearings

trouble continues, it is usually taken to indicate that lime is getting into the system due to improper digestion or improper preparation of the acid for that process. The necessity of keeping the bleaching per cent constantly relatively low while keeping up the consistency is the daily problem, however. Analyses are made continually at this point to insure a check on the operation.

Due to the difficulty in control of dry stock and dilute bleach, expert supervision at this point is highly desirable. If conditions reverse and the bleach strength rises, the pulp is injured due to overbleaching. Pulp thus treated is of greatly reduced value for fabrication.

When the color desired has been obtained, the chlorine is ordinarily practically exhausted. A test is made for this by dropping a few drops of potassium iodide mixed with starch into the bleachers. If there is any free chlorine remaining, the characteristic blue coloration will be obtained. It is practice to drop the contents of the bleacher to the drainer pits just at the point where the chlorine is becoming exhausted. Fifteen minutes is required for this operation. A slight amount of Cl_2 is preferably allowed to remain in the stock in order to make sure that the color will not revert before the washing can remove the products of oxidation.

In these drainer pits a process of continuous leaching or extraction takes place, usually for a period of about 6 hours. Water from the river is sprayed over the entire pit and runs out through screen plates in the bottom to the sewer. When the chlorine has been washed out entirely along with any salts of Ca which still remain, the stock goes to a large bleach storage tank holding 30,000 gal. of stock of 2 to 3 per cent consistency. The difficulty of efficient washing at this point is found to be considerable and a drum washer is recommended to supplement the drainer pit washing. The final stages of preparation of this pulp for use are so similar to the earlier process of preparing for bleaching that they need not be described in detail. Since the bleaching operation has a very definite effect in influencing the character of the fiber, it is again necessary to remove any heavy bundles or foreign material which may have crept in. Another large riffle is used for this purpose. From this apparatus the pulp, carrying about 99 per cent water, goes to three "wet machines." These are devices for mechanically pressing out the water which holds the pulp in solution. The form in which the pulp now exists (about 65 per cent water) is suitable for shipping or for the direct

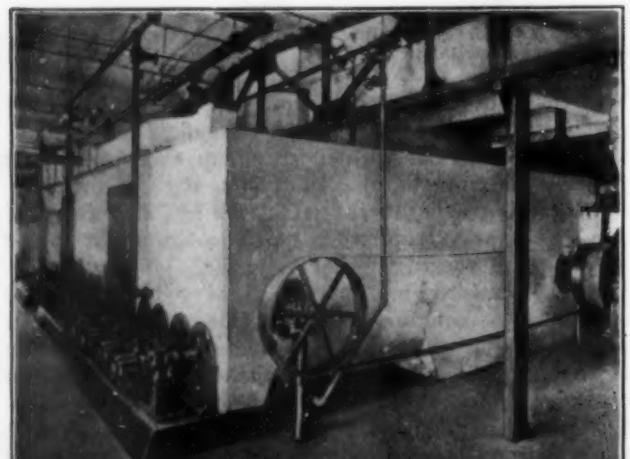

Fig. 6—Rear View of Bleaching Tanks Showing Driving Gear

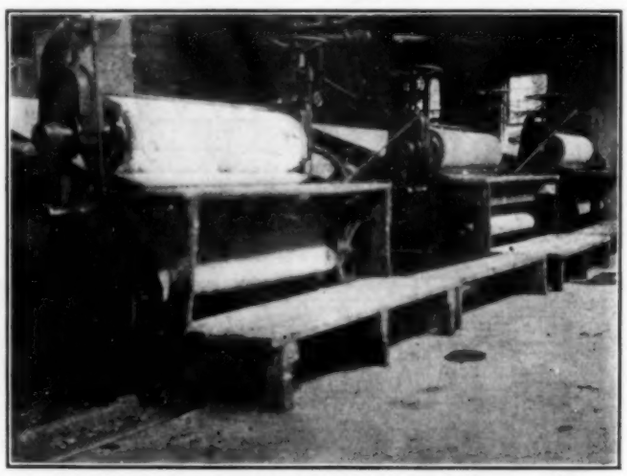

Fig. 7—A Battery of Wet Machines

manufacture into paper. It is interesting to note here than from the time the pulp came into the blowpits of the digestors to this point a total net loss in the fiber or "shrinkage" of less than 8 per cent is involved. Tests have shown that the actual shrinkage of fiber in the bleachers runs close to 4 per cent for spruce and 5 per cent for hemlock.

(In a subsequent article the production of de-inked stock from old magazines will be outlined and the chemical engineering involved in actual book paper fabrication will be discussed.)

Paper Pulp From Banana Trash

According to a T.A.P.P.I. abstract an unusual process has recently been developed in England for producing paper pulp from banana trash. No chemical reagents, apart from those used in the bleaching operation, are required. The raw material, after passing through crushing rolls to remove the juice, is disintegrated in a pulping machine and transferred, together with the juice expressed by the crushing rolls, to a digester, where it is boiled with water for 3 to 6 hours at a pressure of 4 to 5 atmospheres. The fibrous residue is then placed in a beating engine and washed to effect removal of gummy and resinous material. The resulting cellulose is light in color and comparatively easy to bleach.

Cutting Costs With the Rotary Filter

Continuous Removal of Salt From Evaporated Brine Solutions or From Caustic Soda Solutions by Means of a Rotary Filter Seems to Offer Many Operating Advantages

By W. D. Mount
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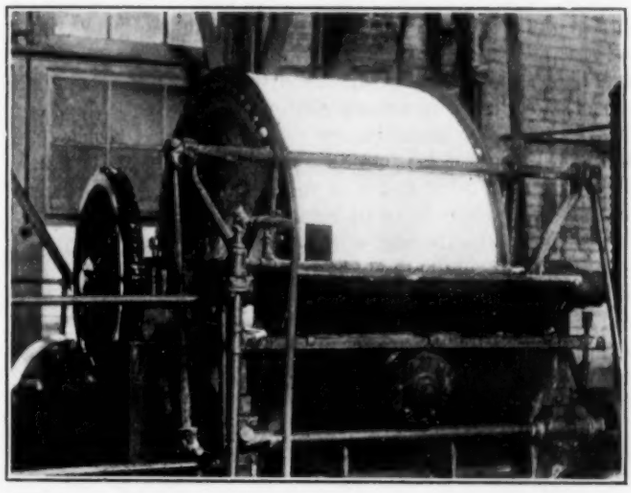
In this brief article consideration will be given only to salts that are precipitated from a mother liquor in evaporators operating under vacuum. It is our purpose to describe how such salts can be removed from the evaporators, filtered and washed continuously with the elimination of manual labor and many of the disadvantages that are often characteristic of the methods generally employed at this time.

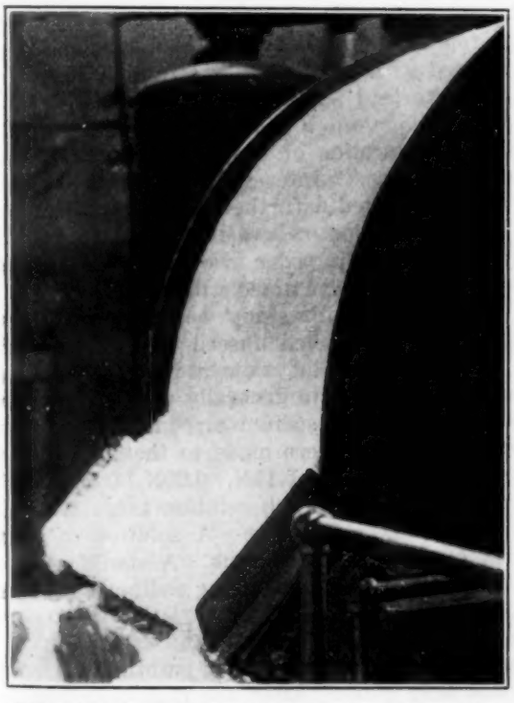
An explanation of how this process is applied in connection with the production of commercial salt from brine and the separation of precipitated salt from concentrated caustic liquors will bring out all of the principles involved. For the sake of brevity and to avoid repetition, we shall confine our remarks to these two applications. Rotary vacuum filters are now being used successfully for handling salt precipitated from solutions of calcium and magnesium chlorides; while this is an important application of the process, we shall not discuss it here, since the field is somewhat limited.



One of a Battery of Four Rotary Filters Handling Vacuum Pan Salt

Commercial Salt

In the manufacture of commercial salt the usual practice is to provide a drop leg to the evaporator in order that a column of brine equal to the vacuum may be maintained. This permits the removal of the precipitated crystals without interruption of the process of evaporation. The bottom of the drop leg connects to the foot of an inclosed elevator, the top of the elevator being at least as high as the brine level in the evaporator.



This Machine Is Filtering Vacuum Pan Salt at the Rate of More Than 200 Tons per Day

The buckets of the elevator are of the basket type and lined with some material which permits the brine to drain out. In plants where centrifugals are not used the salt is discharged from the elevator into drainer bins. Later it is removed by hand and taken either to the stock room or to a drier. Centrifugals are often employed in place of the drainer bins, but subsequent disposition of the product is the same.

Installation and Operation of Filter

The rotary filter is a distinct improvement over either method. Its installation and operation may be described as follows: A small centrifugal pump is located at the foot of the drop leg under the evaporator. By means of this pump the magma of salt and brine is raised to the filter, which should be located at least 30 ft. above the floor in order that the filtrate will drain out of the traps by gravity against the vacuum. In many instances it is entirely practicable to install the filter at a higher elevation so that the filtrate will be drawn back into the evaporator from the hot well beneath the filter trap. Where the latter arrangement is possible, one pump—namely, the one that removes the magma from the evaporator leg—will suffice for the entire cycle of operation.

Although conditions vary in different plants, there are certain improvements in operation that can be effected in nearly every instance by the substitution of filter

equipment for elevators, drainer bins and centrifugals. The pump at the foot of the evaporator leg will deliver salt continuously at any required rate to the filter which, if located in the roof of the stock room, discharges into a conveyor extending the length of the building. The filtered salt can also be diverted to the drier. From this it can be seen that the problem of handling and distributing the product is greatly simplified. Moreover, there is a large reduction in labor, since only one man is needed to supervise the operation of the filter and the necessary auxiliary apparatus. There is no complicated or cumbersome equipment to keep in order, and the cost of maintenance is therefore reduced to a minimum. Operation is continuous, which implies the general advantages characteristic of a continuous method of carrying on any process as compared to an intermittent method of conducting the same process. The moisture content of the filtered salt will average 7 per cent. Salt as discharged from a good centrifugal has a moisture content somewhat lower, but this fact cannot be advanced as an objection to the use of filters, since it is considerably less expensive to filter a given quantity of salt and remove 7 per cent moisture in the drier than it is to handle the same quantity of salt in centrifugals and afterward eliminate the smaller amount of moisture in the drier. In other words, the cost of driving off the difference in moisture content is more than offset by the saving in the operation of filter equipment as compared to centrifugals of equal capacity, even taking into consideration the additional power required for the vacuum pumps.

Salt From Concentrated Caustic Liquors

Various types of the diaphragm electrolytic cell are being used by pulp and paper manufacturers to supply the chlorine needed for bleaching. Since the caustic liquors from all diaphragm cells contain large quantities of salt in solution, it is necessary to concentrate them by evaporation to a point where the salt will be precipitated by crystallization. The evaporation is carried on in multiple effects and it is common practice to remove the salt by periodically emptying the final effect or effects.

A rotary filter installation similar to the one described above will greatly simplify this operation, inasmuch as it transforms an intermittent process into a continuous one; as a matter of fact, the system becomes almost automatic, with a resulting elimination of manual labor. The man in charge of the evaporators can easily give to the filter and connected apparatus the small amount of attention required. Steam consumption is reduced in a marked degree by doing away with the intermittent cooling and reheating of the evaporators.

Elimination of Acid Neutralization

The filter is equipped with sprays by means of which the salt is washed free of caustic with fresh brine. Neutralization with acid, an expensive practice which is made necessary by the inefficiency of present methods of washing, is avoided.

The amount of salt which can be handled by this method, dry basis, is from 4 to 5 tons per square foot of filter area in 24 hours.

That this system for handling vacuum pan salt embraces many desirable features should be generally recognized. It has been demonstrated, however, that its successful application depends almost entirely upon the design of the apparatus. It is a problem that cannot be solved merely by the installation of a rotary filter. Every filter installation should be regarded as a separate problem, irrespective of what may have been done in connection with other applications of this type of equipment, even though they may have been along similar lines. The fact that a filter has successfuly handled finely divided material like concentrate slime or lime sludge does not indicate that the same machine will filter a granular material like salt.

As a general proposition it may be said that the rotary filter is the most economical means of handling vacuum pan salt now available. If properly designed and built, it will give efficient service over long periods of time with few repairs. Those who have watched its development and use will be glad to learn that it has successfully entered another field.

Staining Paint Films

By Harold L. Maxwell
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Some of the factors that determine the protective value of paints and varnishes are only revealed by the microscope. Yet the photomicrography of the paint film is still in a rudimentary stage of development. The present investigation was prompted by interest in the author's previous discussion of "Microstructure of Paint Films" which appeared in our May 14 issue. Herein he shows how a definitely alkaline solution of methylene blue will materially improve the technique in examining white lead paint films.

In the writer's recent paper in *Chem. & Met.* (May 14, 1923, pp. 850-2) photographic evidence was adduced to show that the distribution of the pigment particles in a commercial red lead paint is determined by the proportion of unoxidized lead monoxide, PbO, which reacted with the oil. It was further shown, in a study of white lead paints, that the number of paint coats which make up a film may be determined by staining a cross-section of the film with "mildly alkaline methylene blue." Interest exhibited in this phase of the work prompted a further investigation to determine the concentration of base that is necessary in the methylene blue stain in order to obtain optimum definition of structure in the stained white lead film.

The paint used in this study was made from Dutch Boy white lead and boiled linseed oil in such a ratio that a gallon of the paint contained 14 lb. of the pigment—a proportion quite generally used in practice.

A normal solution of sodium carbonate was prepared from which dilutions were made to the following normalities: 0.05N, 0.10N, 0.15N, 0.20N, 0.33N, 0.50N, 0.66N and normal. To each solution there was added 0.75 per cent methylene blue. A solution of neutral methylene blue served as a check. A similar series of basic solutions was prepared using sodium bicarbonate.

How the Films Were Prepared

Paint films were prepared by painting on smooth tinfoil laid over glass. After the final coat had dried the tinfoil was removed by amalgamation and the paint

film cut in sections 2 to 3 cm. square. The edges were cut straight and at right angles by means of a glass straight edge and a razor. The stain was applied to the edge of the film for half a minute, excess stain blotted and the film washed in water for about 10 seconds. The dried film was held between two microscopic slides, the stained edge parallel to the side of the slide and protruding about a millimeter. The slides were supported on either side by two small wood blocks held in place by a spring clamp. The film held firmly in this way and placed in a vertical position on the mechanical stage of the metallurgical microscope made it possible to obtain suitable photographs without imbedding in paraffine as outlined in the earlier paper. The film used in this work had dried in air for 14 months.

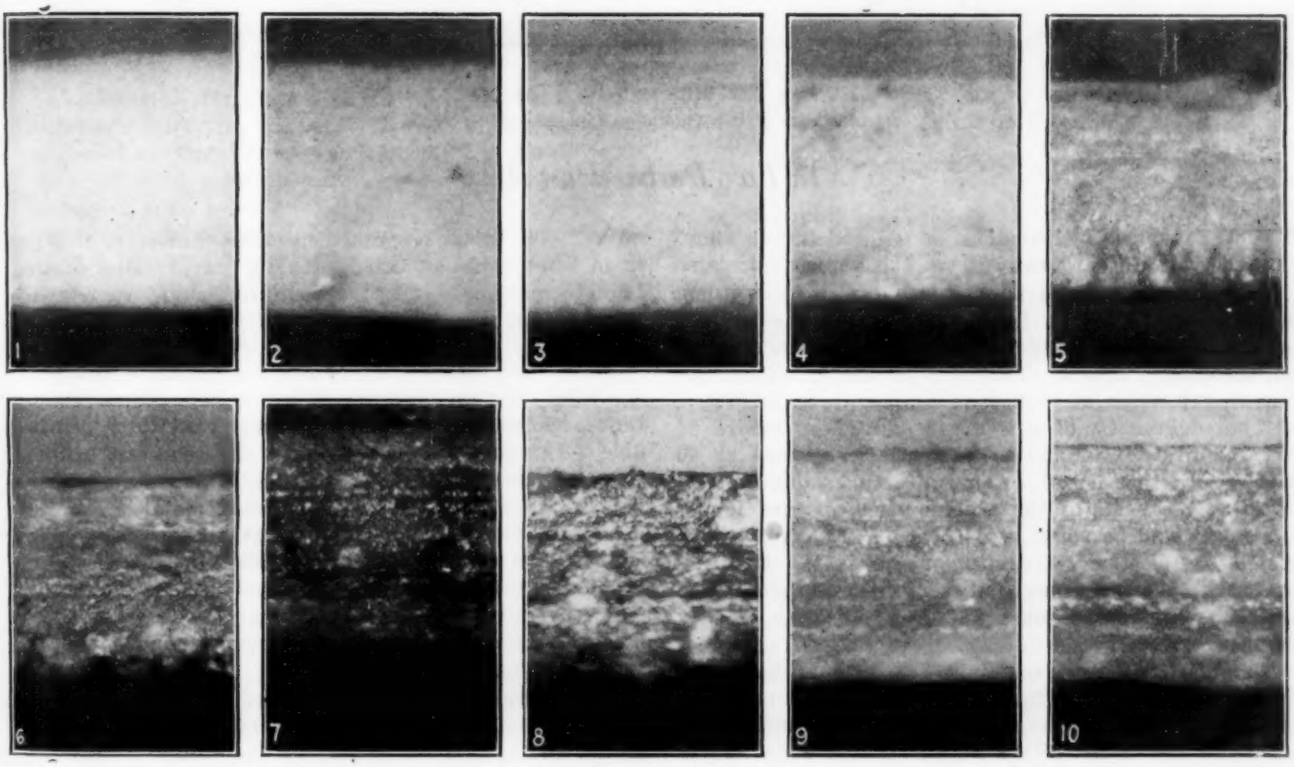
All of the accompanying photomicrographs were taken from the same piece of film. This is made possible by trimming off a thin section of the stained edge and staining the fresh surface with another dye. The non-uniformity in thickness of the various coats is due to the fact that the paint was applied with a brush and a slight ridge may be responsible for the thinness of the subsequent coat at that point.

The photomicrography of rigid bodies presents relatively few difficulties. However, in the photographing of paint films at high magnification one deals with a plastic material which is sensitive to pressure and temperature changes. In this latter case, therefore, superior photographs are obtained only with considerable difficulty.

The photographs require but little comment or explanation. Neutral methylene blue has been found not well adapted to the staining of white lead films. The same is true of the staining solutions that contain very small quantities of the base. However, when the concentration of the base is increased, one is able to see in more detail the structure of the stained film, which makes it possible to determine the number of coats in the paint film. As the concentration of base is increased still farther, the line of demarkation between the different coats becomes less distinct. This is no doubt due to the saponification of the vehicle by the high concentration of base.

From the results obtained in this investigation the writer concludes that a stain consisting of 0.75 per cent methylene blue in 0.5N sodium carbonate solution will give optimum definition of structure in dry films made from white lead and boiled linseed oil. (See Fig. 8.)

The stains made basic with sodium bicarbonate were less satisfactory than those in which sodium carbonate was used. This is to be expected, since the dried film is acidic and the more basic staining reagent would be the more reactive. The use of bicarbonate solution as a solvent for stains has been discontinued. It is believed that further investigation of staining methods for paint films will undoubtedly yield information of practical value to paint users. It is suggested that study should be made of the influence of the acid number of the different vehicles used in paint and the reaction of the dry film to basic stains. Obviously the study of varnishes and enamels would be facilitated by the use of proper stains.



Figs. 1 to 10—The Effect of Staining a White Lead Paint Film With 0.75 Per Cent Methylene Blue in Various Alkaline Concentrations. (Magnification of 200 Diameters.)

Fig. 1—The normal film unstained. Fig. 2—Stained with neutral methylene blue. Fig. 3—0.75 per cent methylene blue in 0.05N sodium carbonate. Fig. 4—0.75 per cent methylene blue in 0.10N sodium carbonate. Fig. 5—0.75 per cent methylene blue in 0.15N sodium carbonate. (As the concentration of the base is increased to 0.5N the number of coats becomes more distinct.) Fig. 6—Stained with 0.75 per cent methylene blue in 0.20N sodium carbonate. Fig. 7—0.75 per cent sodium carbonate 0.33N sodium carbonate. Fig. 8—0.75 per cent methylene blue in 0.50N sodium carbonate. Fig. 9—0.75 per cent methylene blue in 0.66N sodium carbonate. Fig. 10—0.75 per cent methylene blue in 1.0N sodium carbonate.

The Modern Concept of Solid Solutions

How They Are Visualized by the Metallurgist of Today and a Presentation of Working Information Regarding the Constitution and Properties of Alloys

By Zay Jeffries and R. S. Archer
Metallurgists of the Aluminum Company of America

In Two Parts. Part II.

THE thermal expansions of solid solution alloys do not differ greatly from the values calculated from the volume percentages of the constituent metals. The tendency is, however, for the expansion to be less than the calculated amount. For example, the Smithsonian Physical Tables give the coefficient of linear expansion of copper at 40 deg. C. as 0.1678×10^{-4} per degree C., of zinc at 40 deg. C. as 0.2918×10^{-4} per degree C., and of a 72Cu-28Zn brass at 40 deg. C. as 0.1859×10^{-4}. The calculated value for this brass on the basis of the expansivities of pure copper and zinc would be about 0.209×10^{-4}. As compared to changes in electric resistivity and hardness, the usual changes in thermal expansivity are relatively slight and are to be considered somewhat on a par with density changes.

A remarkable and seemingly abnormal change in thermal expansivity is found in the solid solution alloys of iron and nickel. Iron alloys containing more than about 25 per cent nickel retain the gamma (face-centered cubic) lattice at ordinary temperatures even if cooled slowly from a high temperature. With about 36 per cent nickel and 0.15 per cent carbon the alloy (called invar) retains approximately constant volume throughout the temperature range represented by extremes in weather conditions. The coefficient of thermal expansion of iron is 0.0000121 and that of nickel 0.0000128 per degree C. at 40 deg. C. The coefficient of thermal expansion of invar varies from plus 0.0000025 to minus 0.00000005 per deg. C. Invar is of great utility where low coefficient of expansion is desirable. Heating several hundred degrees and cooling to room temperature do not always restore the original length of invar parts. The alloy is preferably used where only moderate changes in temperature are encountered. With a nickel content below or above 36 per cent the coefficient of thermal expansion is higher than that of invar. A solid solution alloy containing about 46 per cent nickel and 54 per cent iron serves as the core of a "dumet" wire used for "leading in" wires of electric incandescent lamps. Platinum was formerly used for this purpose, because its coefficient of thermal expansion is nearly the same as that of glass. The above alloy has the proper expansion and is much cheaper than platinum.

No adequate explanation of the low coefficient of thermal expansion of these iron-nickel alloys has been offered. It is the general consensus, however, that it is in some way connected with the suppression of the transformation of the face-centered cubic variety to the body-centered cubic variety of iron.

Electrical Conductivity of Solid Solutions—Alloys of the solid solution type are of great industruial importance, because of the high electrical resistivity attainable. The curve in Fig. 3 shows the relation between electrical conductivity and composition for the copper-gold alloys. The conductivity of each metal is lowered rapidly by the addition of the other, the lowest conductivity of the series being reached when the two elements are present in approximately equal atomic concentrations. This curve is typical of binary systems the component elements of which form continuous series of solid solutions.

The increase in the resistivity of a metal by the addition of a solute appears in general to be greater the higher the specific resistivity of the solute. Consider, for example, the copper-nickel alloys. The highest resistivity of the series occurs in an alloy containing approximately 50 atoms per cent of each element. The resistivity of this alloy is about thirty times that of copper, but only about five times that of nickel. The addition of nickel to copper has thus increased the resistivity of copper at a much more rapid rate (per atom of solute) than the addition of copper has increased the resistivity of nickel.

The electrical resistivity of a binary solid solution is usually further increased by the addition of a third element which enters into the solid solution.

Coefficient of Resistance—The temperature coefficient of electrical resistance is very much less for solid solutions than for pure metals, reaching a minimum, in a given series of alloys, at a composition near that having the highest specific resistance. The curve relating coefficient of resistance to composition is thus roughly parallel to the curve for conductivity, but the effect of the solute on the coefficient is generally even more marked than upon the conductivity. The alloy containing 55 per cent copper and 45 per cent nickel has a conductivity equal to about one-thirteenth that of copper, and a coefficient of resistance about one-seven hundredth that of copper. Some solid solution alloys ac-

TABLE II—PROPERTIES OF RESISTANCE ALLOYS

Material	Composition	Resistivity Microhms Perm³	Temperature Coefficient 0-100° C.	Temperature Coefficient At 100° C.	Temperature Coefficient At 500° C.
Copper	.....	1.72	0.0040	.....	.....
Constantan Copel Advance Ideal	Copper 55% Nickel 45%	50.0	0.000006	.....	.....
Manganin	Cu 84, Ni 4, Mn 12	44.0	—0.000042	.....	.....
Therlo	Cu 85, Mn 13, Al 2	46.7	0.0000104	.....	.....
Climax	Fe 72, Ni 28	87.0	0.0007	.....	.....
Chromel A Nichrome IV	Ni 80 Cr 20	104.0	.....	0.00020	0.00020
Chromel B Nichrome III	Ni 85 Cr 15	89.0	.....	0.00018	0.00022
Chromel C Nichrome	Ni 61, Fe 25 Cr 11, Mn 3	109.0	.....	0.00023	0.00022

tually have negative coefficients over certain ranges of temperature.

Commercial Resistance Alloys—All of the electrical resistance wires on the market, whether for the dissipation of electrical energy or for heating elements, are made of solid solution alloys or of alloys consisting largely of solid solutions. High specific resistivity and low coefficient of resistance are desirable for both of these purposes. Some of the wires possess such low coefficients that standard resistance coils made of them can be used under ordinary variations of temperature without any correction.

Table II gives values for composition, resistivity and temperature coefficient for a number of commercial resistance alloys, including those used for standard resistances, for electrical energy dissipation and for heating elements.

The highest resistivity given is 109 microhms per cubic centimeter for Chromel C. This is obtained by the addition of three solutes to a solvent (nickel) possessing initially a relatively high resistivity.

Mechanism of Metallic Conduction—Metallic conduction of electricity is supposed to take place by the actual passage of free electrons through the conducting metal. According to Bridgman, no resistance is encountered by the electrons on passing through the atoms of the conductor, all of the resistance being due to the effort required for the passage of the electrons from atom to atom. (See "The Electrical Resistance of Metals," *Physical Review*, 1921, vol. 17, pp. 177-179.)

The decrease in the resistance of a pure metal with fall in temperature is then considered to be due to improved contact between the atoms. Lead becomes a "permanent conductor" at the temperature of liquid helium—that is, its resistance is practically zero. The interpretation of this phenomenon is that the lead atoms continuously touch one another at this temperature and hence offer little or no resistance to the passage of electrons from atom to atom.

Theory of Resistivity of Solid Solutions—The following is quoted from Bridgman: "The other class of alloys is one in which mixed crystals (solid solutions) are formed, the atoms of the two metals entering side by side into the same crystal edifice. This is possible because of a certain degree of resemblance of the two kinds of atoms. The resemblance is not complete, however, and the indiscriminate use of either kind of atom in the crystal edifice is possible only with a certain amount of distortion in the final result. It is a fact that most mixed crystals will not accept an unlimited amount of the foreign ingredient, but the two atoms will crystallize side by side only up to certain limiting proportions. In the mixed crystal structure we would expect, therefore, a certain amount of imperfect fitting between adjacent atoms, with the result that the electrons encounter difficulty in passing from atom to atom, so that, because of the extra resistance of the 'gaps' between the atoms, the resistance of the alloy is greater than that computed from the components (by the rule of mixtures). This is in exact accord with the experimental facts."

Bridgman further points out that the low temperature coefficient is a natural consequence of imperfect

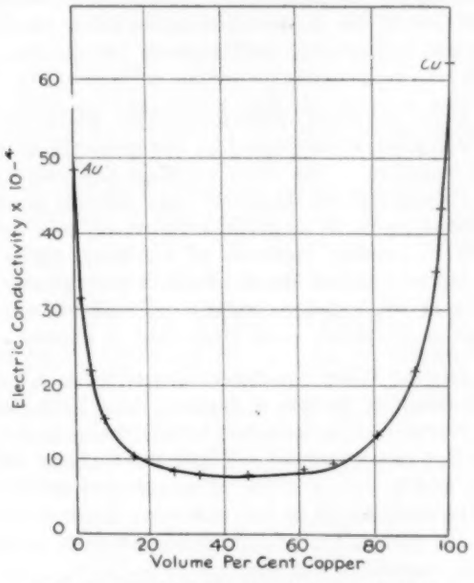


Fig. 3—Electrical Conductivity of Copper-Gold Alloys

fit, because temperature changes would not be expected to affect the degree of fit greatly. "This merely means that the gaps between the different kinds of atoms persist to low temperature, as we would certainly expect."

Hardness and Strength of Solid Solutions—The hardness and strength of metals are increased by the presence of solutes in solid solution. This effect is to be observed in many common alloys, the most familiar illustration perhaps being found in the properties of the alpha brasses. No single set of values can be given as describing completely the mechanical properties of a pure metal or a solid solution alloy, since these properties vary with grain size and are affected by the form and size of test specimen. The hardening effect of zinc on copper may, however, be indicated by the following values for metal in the worked and annealed condition, with what might be called "normal" grain size:

	Tensile Strength	Brinell Hardness
Pure copper	30,000 lb. per sq.in.	35
70-30 Brass	45,000 lb. per sq.in.	55

When two metals form a continuous series of solid solutions, the hardness of each is increased by the addition of the other, the alloy of maximum hardness usually containing about 50 atoms per cent of each metal. The hardness-composition curve of the gold-silver alloys, shown in Fig. 4, is typical.

In cases of limited solubility, the tendency is for the hardness to increase with the concentration of the solute in solution. Information is lacking in regard to solid solution alloys containing high concentrations of a solute of limited solubility, because in the most

familiar alloys of this type the extent of the solubility is relatively low. Among the common alloys the widest range of composition is probably found in the alpha brasses, where the solubility limit for zinc is about 37 per cent by weight, which is equivalent to 36.3 atoms per cent. The tensile strength of these alpha solid solutions increases with the zinc content up to the limit of solubility. It has been reported that there is a slight maximum in Brinell hardness at about 20 per cent zinc. This may be due to an effect of zinc on the grain size. Considering the entire group of properties which are connoted by the general term "hardness," it seems that the hardness of the copper-zinc alpha solid solutions, in this sense, increases continuously with their zinc content.

Plasticity of Solid Solutions—The plasticity of a metal is in general decreased by the presence of a solute in solid solution. The solid solution has less capacity for cold deformation than the pure solvent metal, and is hardened more by a given amount of cold deformation. With similar methods of working, alpha brass, for example, will not stand as much reduction as pure copper, and for a given amount of cold reduction, its hardness is increased more than that of copper.

Ductility of Solid Solutions—Ductility is a property which is complex, in that it depends upon both plasticity and strength and is one for which there is no single standard of measurement. While we can say definitely that the addition to a metal of an element which enters into solid solution in it increases its hardness and decreases its plasticity, we can make no such generalization with regard to ductility.

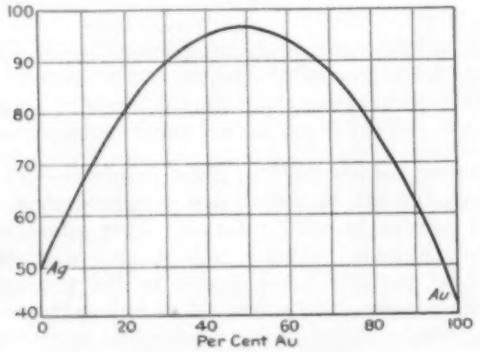


Fig. 4—Hardness of Silver-Gold Alloys

If we consider ductility to be measured by the total reduction in the section of a wire which can be effected by drawing without annealing, then, in general, solid solutions are less ductile than the pure solvent metals. If we consider the extent of the reduction which can be effected in a single die as a measure, then in some cases the ductility of the solid solution is greater than that of the pure solvent.

It is often found that the addition of a solute to a metal increases its ductility, as measured by the elongation in the tensile test. Aluminum, zinc and tin all increase the elongation of copper. Since commercial copper contains copper oxide and these elements all reduce copper oxide, it might be suspected that their effect on elongation is due to deoxidation of the copper. That this is not the case is shown by the fact that the maximum elongation is attained only after the addition of an amount of aluminum, zinc or tin greatly in excess of that required for complete deoxidation.

Our knowledge of alloys has been greatly increased during the last few years (especially since the introduction of the X-ray spectrometer) by the evolution of new conceptions regarding solid solutions.

In the normal course of events in any line of endeavor, progress is made in theory, followed by progress in practice. Theories are evolved and discussed and used as a basis of experiments. There finally comes a time when some concepts are discarded and the others are widely accepted and combined to give a useful collection of working information. This point has been reached in the case of solid solutions, which form at least part of the structure of nearly every metal. The authors have compiled the accepted useful information and it is being presented in two parts, of which this is the second.

The elongation of magnesium, in the form of extruded rod, is more than doubled by the presence in solid solution of 4 per cent of aluminum. A similar increase is found in sand castings. With higher percentages of aluminum the elongation decreases.

There does not appear to be any element the addition of which to pure aluminum increases its elongation. The elongation is definitely reduced by the addition of most elements. For material in the form of rolled and annealed bars, zinc does not seem to reduce the elongation very much up to about 10 or 15 per cent. Further additions of zinc cause a definite decrease in elongation.

The reduction of area in the tensile test is generally less for the solid solution than for the solvent, even when the elongation of the solid solution is the greater. The solid solution alloys do not show as much tendency to draw out locally, or "neck," as do the pure metals.

A Temperature Analogy—The effect of a solute on the mechanical properties of a metal are in many ways similar to the effect of a lowering of temperature. The addition of zinc, tin or aluminum to copper increases its hardness and strength and the rate at which it is hardened by cold work. The elongation is increased, but the reduction of area becomes less. All of these effects are produced in pure copper by lowering the temperature of test.

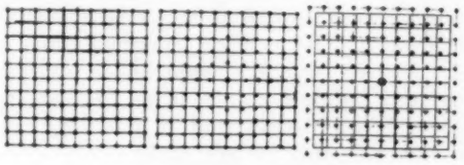
That this analogy is not complete is shown by a consideration of other physical properties. The electrical conductivity of copper is increased by lowering of temperature, but is decreased by the addition of a solute.

Theory of Hardness of Solid Solutions—The factors influencing the hardness and strength of solid solution alloys have mostly been considered above in connection with solid solubility, density, tendency toward the formation of intermetallic compounds, and electrical conductivity. Naturally the same factors that influence other properties of solid solutions affect the hardness, but all properties are affected in different degrees. For example, a certain mixture of nickel and copper will have about double the hardness of copper but an electric resistivity about thirty times that of copper.

Since hardness may be regarded as resistance to permanent deformation and permanent deformation of crystalline metals takes place largely by the movement of crystal fragments along slip planes, it follows that increased hardness must be caused by increased resistance to slip or slip interference. The discussion of the hardness of solid solution alloys thus resolves itself into one of the probable causes for increased slip interference. Bridgman postulated an imperfect fit of solute

atoms in the lattice of the solvent metal and a "certain amount of distortion in the final result." He regarded the increased slip interference as due to a sort of staggering of the atoms on the potential slip planes. Rosenhain ("Hardness of Solid Solutions," *Proc. Royal Soc.*, London, vol. 99, p. 192; *Chem. & Met.*, vol. 25, Aug. 10, 1921, p. 243) advanced as a general theory of the increased slip interference of solid solutions the hypothesis that solute atoms distort the lattice of the solvent metal and that the increased resistance to slip is due to this distortion.

Figs. 5, 6 and 7 represent Rosenhain's conception of the action of a large solute atom on a ductile lattice



Figs. 5, 6 and 7

Fig. 5—Spacing of atoms on principal plane of cubic lattice (Rosenhain). Fig. 6—Distortion in ductile lattice due to larger stranger atom (Rosenhain). Fig. 7—Distortion in stiff lattice due to large stranger atom.

and on a brittle one. In this case the solute atom is supposed to have less attraction for the solvent atoms than the latter have for one another. In the ductile lattice, according to Rosenhain, this causes local distortion and in a brittle lattice general distortion, as shown in Figs. 6 and 7. The supposed difference in the manner of distortion of the lattices of ductile and brittle metals seems improbable, because the property of ductility is not evidenced until permanent deformation takes place, whereas the nature of the distortion must exist prior to any attempt to deform.

Furthermore, the solid solubility of the solute is regarded by Rosenhain as being dependent on the amount of lattice distortion, the greater the distortion the less the solid solubility.

The present authors have ("Slip Interference Theory of the Hardening of Metals," *Chem. & Met.*, June 15, 1921, vol. 24, p. 1057) regarded the increased resistance to slip as due partly to a greater attraction between unlike atoms of a solid solution than between like atoms, and partly to a general roughening of slip planes, due to the difference in size between solvent and solute atoms. The general statement may be made that when two elements form extensive solid solutions or intermetallic compounds the attractive forces between the unlike atoms exceed those between the like atoms, since otherwise neither extensive solution nor combination would take place. That there should be distortion of the solvent lattice, due to the presence of solute atoms, seems logical. That such distortion, especially if it is the result of relatively high attractive forces between the unlike atoms, should increase slip interference seems certain.

The idea should not be accepted too eagerly, however, that any kind of distortion of the solvent lattice necessarily increases hardness. The first step in the permanent deformation of a metal is the "distortion" of the lattice by applied stress. In fact, the lattice must distort in a certain manner before slip can take place. In Rosenhain's illustration, given in Fig. 6, the supposition that the solute atom has less attraction for solvent atoms than the latter have for one another might produce a condition of weakening along the planes on either side of the foreign atom, because part of the work required to produce slip in the lattice of the pure solvent metal would be accomplished by the foreign atom.

It was mentioned in connection with the discussion of electrical conductivity that atoms in solid solution might cause a "fixing" of some electrons and that such "fixing" of some of the free electrons might contribute to the hardness. With our present knowledge of solid solutions there remain certain unexplainable results, which we can refer to the unknown nature of the bonds between the unlike atoms in the alloys. The hardness, as well as other properties, such as solid solubility, density, electrical conductivity and in fact all properties of solid solution alloys, depends to a large extent on the sizes of the atoms and the as yet imperfectly understood property which we have called specific attraction between the unlike atoms.

We wish to acknowledge our indebtedness to Dr. Bain for his courtesy in furnishing some of the diagrams.

Ignition Points of Metals in Oxygen Under Pressure

Spontaneous ignition of metals in oxygen under pressure is the subject discussed in the second of a series of papers presenting the results of an investigation being made by the Department of the Interior, through the Bureau of Mines, on oxygen-oil explosions. The experiments described in this paper were undertaken to determine (1) the relationship between oxygen pressure and the ignition temperature of the metals most frequently used in high-pressure oxygen apparatus, and (2) the metals most suitable, as regards safety and freedom from combustion, for use in high-pressure oxygen systems. A study was made of the relation between ignition temperature and pressure for iron, copper and brass, which are the three materials usually employed, and for lead.

It was found that, under high oxygen pressures, iron and steel burn very readily and completely, and if once ignited propagate a flame with almost explosive velocity. On the other hand, brass and copper appear to burn only very slightly. With brass, a slight combustion apparently takes place.

It would seem that the use of iron or steel in the construction of manifolds, etc., might be a dangerous practice once the material is raised to its ignition temperature. It seems probable that copper, and perhaps brass, would survive a higher temperature than steel, and at most, should any condition cause the manifold and piping to reach a temperature sufficiently high to melt the metal, it would merely melt away and release the oxygen, without burning or propagating a flame.

The lowering of ignition temperature with increase in oxygen pressure is shown graphically and, so far as known, has not previously been demonstrated in any published experiments. The greatest change noted is in iron. At atmospheric pressure, iron in oxygen ignites at approximately 930 deg. C., while at 2,000 lb. per sq.in. the ignition temperature drops to approximately 600 deg. C.

The results of these experiments are given in Serial 2521, by J. J. Jakowsky, assistant engineer, and E. W. Butzler, assistant to physicist. A general outline of the problem of oxygen-oil explosions being studied has been given in the first report, Serial 2507. Copies of either or both reports may be obtained from the Department of the Interior, Bureau of Mines, Washington, D. C.

Weighted Index Number for Motor Fuels

Proposing a New Method of Expressing the Volatility of Gasoline in Such a Way as to Make Comparisons More Satisfactory

By W. A. Gruse
Mellon Institute of Industrial Research, Pittsburgh, Pa.

The most important quality of a motor fuel—its volatility under conditions of use—is not represented adequately by the conventional distillation curve, but is measured approximately by the dew point. As the distillation test is a simple one, Dr. Gruse has worked out a relationship between the distillation curve and the dew point, making possible a fairly good evaluation of a motor fuel by distillation.

A low index number expresses high volatility and indicates good starting and accelerating properties with low oil-diluting tendencies.

IN RECENT papers by Wilson and Barnard (*J. Ind. Eng. Chem.*, 1921, vol. 13, p. 906; *J. Soc. Automotive Eng.*, 1923, vol. 12, p. 287) it has been pointed out that the dew point of a gasoline bears an approximately linear relationship to the 85 per cent point on the conventional distillation curve for the fuel in question. The value of such a relationship is obvious, since the distillation test is a routine practice for the petroleum industry and is much simpler than any dew point determination. It was shown by Wilson and Barnard that the relationship of the 85 per cent point to the dew point is better than that of any other single point on the distillation curve. There is, however, an inherent difficulty in the use of any one point on this type of curve: that is the possibility of producing, by suitable blending, two or more gasolines with the same 85 per cent point, but with otherwise widely different distillation characteristics, which, except in the case of a happy balancing of tendencies, will result in widely different effective volatilities, as measured by dew points. It is to be expected that, with distillation curves of approximately the same shape, the relation between the dew point and some point on the curves, such as the 85 per cent point, would be fairly regular. That this does not follow for fuels with curves of different shape is shown by the two fuels studied by Wilson and Barnard, Red Crown and Fractionated "B" gasolines, which have the same 85 per cent points to within a degree or so (183 deg. and 184 deg. by interpolation), but dew points, as determined by these authors, of 48 deg. and 66 deg. respectively. In the same way, Red Crown and "Special Blend" gasolines have the same dew point, 70 deg. by the equilibrium solution method, but 85 per cent points of 183 deg. and 200 deg. respectively.

In seeking a relationship which would be somewhat more satisfactory for fuels of different composition, it seemed necessary to take into account the varying shapes of the distillation curves, by weighting the temperature values at certain points on the curves; it also seemed reasonable to select the points to be used, with reference to the probable engine performance of the fuels in question, as indicated by current research. With this in mind, the expedient was tried of making up an index number which included points on the first part of the curve to express starting and accelerating qualities, points on the middle portion to express the volatility of the greater portion of the fuel and points near the end to take into account the large effect of small amounts of heavy ends on the dew point, and hence on the effective volatility, of the fuel. The importance of the last point has been demonstrated by the author in a previous paper (*J. Ind. Eng. Chem.*, 1923 vol. 15, p. 796), where it was shown that small percentages of heavy fractions and of kerosene raised the dew point markedly. The method pursued was entirely empirical; sets of numbers were added together and plotted against the dew points at 15 to 1 of the fuels in question. It was found that it was very necessary to include the end point for any satisfactory agreement, which harmonized with the influence of heavy ends on dew points. The best combination of figures was found to be that obtained by adding the 10, 20, 50, 70 and 90 per cent points and the end points.

Fig. 1 shows the relation of the dew points available to the 85 per cent points of the gasolines, and Fig. 2 that of the same dew points to the index numbers made up as described. In each case the line was drawn with reference to the five points given by the five fuels the dew points of which had previously been measured directly by the writer (*loc. cit.*), points indicated by circles; data of Wilson and Barnard were then used to supply the additional points, indicated by crosses. As the writer has shown that the dew points of Wilson and Barnard lie some distance below those determined directly, a constant was added to each of their values. (Independent work by another method at the Bureau of Standards has confirmed the results given by the direct method.) This constant was obtained by averaging all the differences between dew points on the same gasolines determined by the writer and by Wilson and Barnard; it amounted to 22 deg. If, instead of averaging all differences, those had been chosen which apply only to the fuels of average composition and hence are more probable, the constant would have been 26 deg., and four points on the index plot, now lying below the line, would be practically on the line. This is exemplified by Co-operative Gasoline A; its true dew point of 51.5 brings it exactly on the line, but the value of 46 deg., obtained from Wilson and Barnard data, lies 6 deg. below the line. It will be observed that on the 85 per cent plot, Fractionated gasoline, Special Blend and High End Point gasoline lie 10 or more

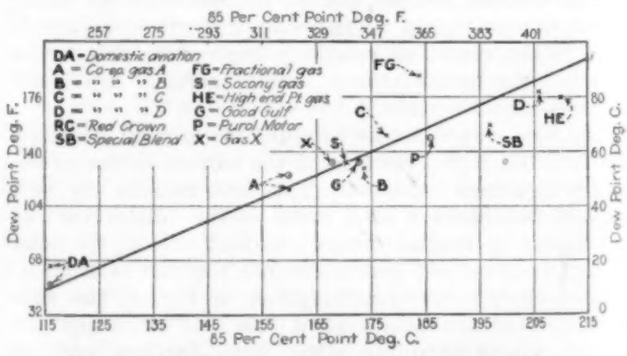

85 Per Cent Point Deg. F.
257 275 293 311 329 347 365 383 401
DA = Domestic aviation
A = Co-op. gas A
B = " " B
C = " " C
D = " " D
RC = Red Crown
SB = Special Blend
FG = Fractional gas
S = Socony gas
HE = High end Pt. gas
G = Good Gulf
P = Purol Motor
X = Gas X
Dew Point Deg. F.
176 140 104 68 32
80 60 40 20 0
Dew Point Deg. C.
115 125 135 145 155 165 175 185 195 205 215
85 Per Cent Point Deg. C.

Fig. 1—Relation of Dew Points to 85 Per Cent Points for 13 Gasolines

Presented before the Division of Petroleum Chemistry at the Sixty-sixth meeting of the American Chemical Society, Milwaukee, Wis., Sept. 12, 1923.

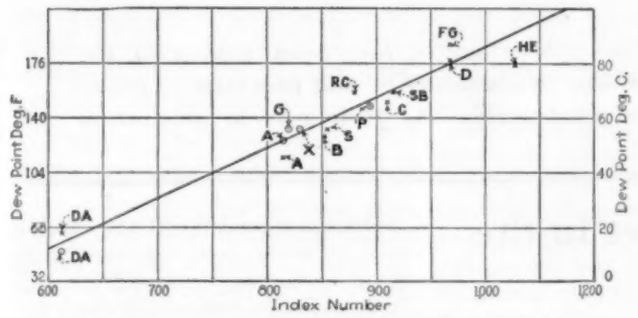


Fig. 2—Relation of Dew Points to Index Numbers for 13 Gasolines

degrees from the line; on the index plot only one of these lies 10 deg. off. The average distance of all points from the line on the 85 per cent plot is 5.6 deg.; on the index plot, 3.9 deg. It should be noted that the directly determined dew points show good agreement, and it is believed that accurate determinations for the others would bear out the relationship still more strongly.

If the index curve be used to determine the dew points of Red Crown and Fractionated gasolines mentioned above, which have the same 85 per cent points, the index numbers of 877 and 967 give dew points of 64 deg. and 80 deg. respectively, which agree better with the indirectly determined values of 70 deg. and 88 deg. than the 45 + 22 = 67 deg. deduced for each from the 85 per cent point. In like manner Red Crown and Special Blend gasolines have index numbers of 877 and 919, indicating dew points of 64 deg. and 72 deg., which agree slightly better with the indirectly determined point of 48 deg. + 22 deg. = 70 deg. for each than do the 67 deg. and 77 deg. values obtained from the 85 per cent points.

Fuel Co-op. Gasoline	Index No., Deg. C.	Dew Point 15 to 1 Direct Deg.	Indirect + Const. C.
A	815	51.5	46
B	853	....	54
C	910	....	66
D	967	Above 75	82
Red Crown	877	....	70
Good Gulf	818	56	57
Domestic Aviation	612	11	18
Gasoline X	830	56	55
Socony	857	..	56
Purol Motor	895	65	67

It may appear that an integration of the entire distillation curve or a similar evaluation of the differential distillation curve would be a more rational expedient; the procedure outlined recommends itself, however, because of its simplicity. It is believed that the index number may be of service as an approximate expression of the volatility of motor fuels, of their general performance in a motor, and perhaps of the extent to which they might be expected to dilute crank case lubricating oil.

As examples of the size of the index number, its values, together with the dew points, are tabulated for the four co-operative fuel research gasolines (*J. Soc. Automotive Eng.*, 1923, vol. 13, p. 3) and for several commercial gasolines.

Acknowledgment

The writer is indebted to D. P. Barnard for distillation data on the gasolines used in his dew point studies, and to Dr. W. F. Faragher for helpful suggestions and criticism.

Research Work on Oil Shale

Bureau of Mines Endeavoring to Find Best Methods of Retorting the Shale and Refining the Oil

RESEARCH work on oil shale is now being conducted by the Department of the Interior, through the Bureau of Mines, in co-operation with the State of Colorado, the University of Utah and the Department of Conservation of the State of Indiana. The object of this work is twofold: First, to determine the conditions of retorting that produce the highest yields of the best oil from various shales, and second, to make a thorough study of methods of refining shale oil.

Research conducted by the Bureau of Mines at the Boulder laboratory, in co-operation with the State of Colorado, for the past year has been with an experimental vertical retort, a large horizontal retort and a small assay retort.

The experimental vertical retort is so designed that it gives results which might be comparable to those obtained from commercial retorts of this type. Experiments are being made to determine the effects of time and temperature of preliminary heating, holding at various temperatures, use of steam in the retort, etc. A complete analysis is made of all the products obtained.

The results obtained with the horizontal type of retort have not been very satisfactory, as it gives a lower yield of oil of a poorer grade than that obtained from the other retorts.

Most of the refining experiments of the Bureau of Mines have been centered upon the refining of gasoline or motor fuel from shale oil. This work, which has been partly completed, has shown that good grades of these products can be produced.

Important Information Obtained

Assay retort studies have been made with typical American shales, in comparison with shales from the foreign fields which are used in producing commercial shale oil. This work should have an important bearing on the question of how far the present oil shale practice in foreign countries may be adapted for use in this country.

At Salt Lake City the problems being studied are: The distribution of sulphur and nitrogen in oil shale and its products, the separation and examination of kerogen, the approximate and ultimate analyses of the shale and ash, the determination of the best conditions for recovering ammonia or other nitrogen products from American shales, and thermal decomposition of the oil-yielding materials from oil shale.

Determination of the distribution of sulphur and nitrogen involves the distillation of various shales from the most important deposits of this country, and the examination of the products. The results of this study may give important information regarding the refining of shale oil. The separation and examination of kerogen, and the approximate and ultimate analyses of the shale and ash, give information relative to the organic matter in the shale and the oil yield. The study of the best conditions for recovering ammonia includes a determination of the form in which the nitrogen compounds exist in the shales.

The work conducted in co-operation with the University of Indiana involves the study of the geology of the shale deposits throughout the state and the examination of numerous samples collected from all the deposits.

Evaporation

The articles under this head deal with the various fundamental or unit processes of chemical engineering and their part in production

Some Evaporator Problems Met in the Paper Pulp Industry

Critical Review of Processes and Equipment From the Operator's Viewpoint, Both in the Soda and Sulphate Pulp Mill and in the Sulphite Mill

By George K. Spence
Chief Chemical Engineer, New York & Pennsylvania Co., Clarion Mills, Johnsonburg, Pa.

THERE are two phases of the subject of evaporation to be considered in the paper pulp industry. One deals with the evaporation of spent liquors from the soda and sulphate pulp mills in order to reclaim the soda. The other deals with the evaporation of waste spent liquor from the sulphite mills in order to produce valuable byproducts, such as road binder, core binder, tanning extracts, etc.

In the former case it is almost the universal custom to use multiple effect vacuum evaporators; while in the latter case, multiple effect evaporators, vacuum drum driers and waste heat evaporators have been used.

Available Types of Equipment

There are ten different makes of multiple effect evaporators on the market today, all of which have their special features. While some may be better than others for special purposes, when all is said, any good standard evaporator with proper attention should produce efficient results.

The Yaryans, Scott and Lillie are of the rapid circulation film type; the Kestner and Badger are of the long vertical tube climbing film type; the Zaremba, Swenson and Newhall are of the submerged tube type; the Manistee Iron Works evaporator is of the vertical tube type with a revolving propeller to assist the circulation. The Buffalo Foundry & Machine Co. manufactures two different rapid circulation film type evaporators for the above purpose. One is a horizontal evaporator and the other is a vertical tubular evaporator.

In the Zaremba, Swenson and Newhall evaporators, the steam passes through the tubes and the liquor is on the outside of the tubes; while in all other types mentioned the liquor passes through the tubes and the steam is on the outside. All of these evaporators are made in double, triple and quadruple effects, and are provided with catch-alls to catch entrained liquor and prevent it from passing over with the steam. They are all provided with condensers and vacuum, feed and tail pumps.

Multiple Effect Evaporators

Multiple effect evaporators can be operated on low-pressure exhaust steam from non-condensing engines, since 95 per cent of the heat entering these engines is available in the exhaust steam. If these engines are in use and there is no other outlet for the exhaust steam, it can be very economically used in the evaporators. At the present time most mills are equipped with steam turbines and motor drives, so that it is customary to use live steam in the evaporators. This steam pressure varies from 15 to 30 lb. and the vacuum in the last effect from 24 to 27 in. In order to procure efficient results with any form of multiple effect evaporator, it is necessary to keep the liquor free from stock and to maintain a high vacuum on the last effect.

There is no system of pan washing so nearly perfect that it does not permit some stock to pass through the perforated pan bottoms and to be carried with the liquor to the evaporators. If this stock is not removed before entering the machine, it will have a tendency to plug the tubes, making it necessary to shut down the machine and wash the stock from the tubes. This very much decreases the capacity of the machine, and in every well-regulated evaporator room some form of filter should be installed to remove the stock from the liquor before passing it to the machine.

The writer has made a number of tests of liquor going to the evaporators from the wash pans and finds the amount of stock varies from 700 to 1,200 lb. when handling 350,000 gal. of weak liquor in 24 hours. An efficient filter will remove practically all of the fiber from the liquor, records showing the amount of stock passing the filter not to exceed 15 lb. in 24 hours when handling the above amount of liquor. In addition to increasing the capacity of the evaporators the stock saved will more than pay for the installation and operation of the filter.

Importance of High Vacuum

One does not readily appreciate the extent to which decreasing the vacuum will affect the efficiency of the evaporator.

The attention of the writer was recently called to an evaporator which carried only a 20-in. vacuum on the last effect, and the machine was condemned because it was not producing efficient results. Let us compare the efficiency of an evaporator working under a 20-in. vacuum instead of 27-in. vacuum. If the steam pressure were 25 lb. in each case, the temperature of the steam would be 266 deg. F. The excess boiling point of liquor in each effect is assumed to be respectively 3 deg. F., 8 deg. F. and 18 deg. F., or a total of 29 deg. F. Therefore the net temperature range at 20-in. vacuum is (266 deg. — 162 deg.) — 29 deg. = 75 deg. The net temperature range at 27-in. vacuum is (266 deg. — 112 deg.) — 29 deg. = 125 deg. The water evaporated would be in direct proportion to the temperature ranges. Therefore the capacity of the machine would be increased 66⅔ per cent by increasing the vacuum from 20 in. to 27 in. If the machine evaporated 1.87 gal. of water per hour per square foot of heating surface when working under

a 20-in. vacuum, it would evaporate 3.12 gal. per hour per square foot of heating surface if the vacuum were increased to 27 in.

Figuring Heating Surface

When figuring the heating surface of an evaporator, the heating surface of one body is always taken, whether it be a double, triple or quadruple effect machine; and where the surfaces differ in the different effects, the total in all effects is taken and divided by the number of effects to obtain the average heating surface for each effect.

Multiple effect evaporators are intended to operate on a high-vacuum principle and when working under proper conditions a double effect should evaporate 1.8 lb. of water; a triple, 2.7 lb. of water; and a quadruple, 3.6 lb. of water per lb. of steam consumed. In other words, for the evaporation of each 1,000 gal. of water per hour, a double effect evaporator will consume 4,630 lb. of steam; a triple, 3,080 lb.; and a quadruple, 2,310 lb. The cooling water necessary for a triple effect machine evaporating 1,000 gal. of water per hour would be 175 gal. per minute of 70 deg. F. water, or 235 gal. per minute of 80 deg. F. water; while that necessary for a quadruple effect machine would be 130 gal. per minute of 70 deg. F. water, or 175 gal. per minute of 80 deg. F. water.

Causes of Low Vacuum

The causes of low vacuum are leaks around the different effects, high-temperature condenser water and inefficient vacuum pump. There is a tendency at times to use too much water in jet condensers, when in summer the water is too warm for efficient results. This will flood the vacuum pump so much with water that it will not have the proper pull on the last effect. This condition can be improved to some extent by using cataract condensers, which consume a comparatively small quantity of condensing water, do not flood the pump but allow it to pull a large amount of air in addition to the water, and maintain a higher vacuum on the machine.

In a number of mills the weak liquor is preheated before entering the evaporators, which is considered an advantage.

In order that the operation of the evaporators can be properly controlled it is advisable to install a venturi meter so arranged that the liquor going to each evaporator or the total liquor supplied to all of them can be measured from time to time.

Some operators advise the reverse flow of the liquor in the evaporators; that is, having the weak liquor enter the third effect and discharging the strong liquor from the first effect. They claim that it is more economical to work the machine in this way. This is not true regarding the steam consumption in the evaporator unless the temperature of the weak liquor is low. When the temperature of this liquor is 160 deg. F. or higher, as is usually the case, there is no economy in steam consumption by using the reverse flow method.

In this article Mr. Spence, who is chairman of the committee on soda pulp of the Technical Association of the Pulp and Paper Industry as well as chief chemical engineer for one of the largest soda pulp mills, shares with the reader his long operating experience in solving some of the knotty evaporation problems of the paper pulp industry.

There is, however, an advantage in having higher temperature liquor for the rotaries by using this system. It is of greater advantage to stagger the flow; that is, feed the weak liquor in the second effect, flow from the second to the third effect and finish in the first effect. This method will give greater economy of steam consumption than the reverse flow system and accomplish the same results as regards temperature of strong liquor for the rotaries. It will require larger units to handle the same amount of liquor when using the reverse or staggered flow systems, due to the fact that the volume of the vapors given off will be less when using any other than the forward flow method.

Reclaimed spent sulphite liquor is either neutralized before evaporation (as by the Robson Process Co.) or evaporated just as it comes from the blow pits. When neutralized it can be handled with the same evaporators as are used in evaporating spent liquor from the soda and sulphate pulp mills. When the liquor is concentrated straight without previous neutralization it is necessary to have the evaporator shells made of an acid-resisting material or lined with such; and in addition all tubes, fittings, pumps, etc., must be acid resistant. The byproduct made from the spent sulphite liquor is put on the market either in liquor form, testing from 30 deg. to 32 deg. Bé. at 60 deg. F., or in powdered form. When sold in powdered form it is usually customary to concentrate the liquor to about 25 deg. Bé. in multiple effect evaporators and then bring to a solid either in vacuum drum driers or by spraying in chambers heated by superheated steam.

The Dickerson Process

The Dickerson process differs from others in that 6 deg. liquor is brought to the solid without the use of multiple effect evaporators, the work all being done with waste heat from the boiler room. In this process there are two chambers, one known as the wet chamber and the other as the dry chamber. The wet chamber is banked all through with spray nozzles, and part of the hot gases from the boiler plant is passed through this chamber, coming in contact with the fine spray of liquor from the nozzles. The liquor is concentrated to about 21 deg. Bé. in this chamber. The remainder of the hot gases from the boiler plant is passed through the dry chamber and the 21 deg. Bé. liquor is sprayed into this chamber at 1,000 lb. pressure. Here the evaporation is completed and the product falls to the bottom of the chamber in powdered form. This powder is dragged to the back end of the chamber and packed in bags for shipment. The black dirt from the waste flue gases is removed by the Cottrell precipitation system before entering the chambers. The Dickerson system produces a powder which had a good binding quality and is well up in tans when prepared for the leather industry.

Fleisher Waste Heat System

The W. L. Fleisher waste heat system is somewhat similar to the Dickerson process, with the exception that the liquor is first concentrated in a multiple effect evaporator and then sprayed into the hot gases from the boiler plant.

While neutralization of the liquor will decrease the cost of the evaporator installation, the writer has concluded from a number of tests made that this treatment decreases the binding quality as well as the percentage of tans to non-tans in the finished products.

The Case for the Multiple Effect Evaporator in the Pulp Mill

Recovery of Black Liquor Has Important Bearing on Problems of Evaporator Design and Operation

By H. Austin
Chemical Engineer, Ernest Scott & Co., Fall River, Mass.

THE ECONOMICAL recovery of black liquor resulting from the digestion of wood in pulp production is of paramount importance for the average soda or sulphate pulp mill. The spent black liquor must be concentrated in an apparatus that will operate at lowest possible fuel cost and that is reasonably economical to install.

The fact is not overlooked that in every pulp mill recovery house the rotary incinerators produce gases containing considerable quantities of waste heat which can be utilized advantageously. However, the heat contained is not sufficient to evaporate the large percentage of water present in the spent black liquors unless the mill has a vacuum evaporator. If a mill is dependent on direct heat disk evaporators alone for concentrating the black liquors, it is always necessary to use large quantities of fuel wood in the smelting or incinerating furnace, otherwise the spent black liquors become unmanageable. Even with the aid of large quantities of fuel wood, it is frequently difficult to take care of the black liquor, and in that case the capacity of the pulp mill suffers. The use of fuel wood for the purpose described is not only very expensive but very wasteful, because the wood might better be converted into pulp, in which form its value would be decidedly increased. It is argued that because a direct heat disk evaporator utilizes the heat from the incinerating furnace which would otherwise be wasted, it is a necessary part of black liquor recovery equipment. It is the opinion of the author, however, that the incinerator waste heat gases would be much better utilized in a boiler, placed back of the rotary incinerator, for the purpose of generating steam wherewith to concentrate the black liquors in a multiple effect evaporator. When the waste heat gases are used in a disk evaporator they can give up their heat for evaporating water only in part. The water evaporated then passes up the chimney stack. However, if the heat units in the waste gases are used in a boiler for making steam, which is in turn used in a multiple effect evaporator, the benefit of the several effects is obtained, and according to the number of effects used the amount of water evaporated is multiplied as compared with the evaporation possible in the direct heat disk type apparatus. For instance, with a quadruple effect vacuum evaporator, it is theoretically possible to concentrate (using only the same waste heat gases) from three to four times the amount of black liquor that can be concentrated with those waste heat gases in a disk evaporator, the degree of concentration of the black liquors in each case being to the same point.

Why Multiple Effects Pay

The benefit to be obtained by multiple effect vacuum evaporation has been widely appreciated, and most modern mills are now provided with equipment of this kind, although it is still customary to utilize the incinerator waste heat gases in a direct heat evaporator. Steam for working the multiple effect evaporator is provided from the mill boiler supply. Additional economy may, however, be obtained by raising the steam for working the multiple effect evaporator from a boiler utilizing the incinerator waste gases in the way above described. The boiler used should have large tubes, or flues, with suitable arrangements for easy cleaning.

Vacuum evaporation, in utilizing the fact that water under reduced pressures evaporates at reduced temperatures, makes it possible to use series of evaporators, each unit of which uses the steam from the preceding unit, by reducing its pressure. Theoretically it should be possible in a single effect evaporator to evaporate almost 1 lb. of water per pound of steam used; in a double effect almost 2 lb. per pound of steam used; in a triple effect almost 3 lb.; in quadruple effect close to 4 lb., and so on. In practice, however, these efficiencies are seldom if ever reached. Decreased by no more than 15 per cent, an excellent result is being obtained, however. Radiation and condensation losses and also heating of the raw liquor fed to the evaporator make some such loss unavoidable. Moreover, all pulp black liquors are composed of materials that have a higher boiling point than that of water, and in such cases the "heat of concentration," caused by that higher boiling point, has to be provided for.

Theory Involved

As above stated, multiple effect evaporation depends upon the temperature difference that can be secured between each of the effects. As the temperature at which the liquor, definitely concentrated, boils in a known vacuum is a non-variable figure, it is the temperature, or rather pressure, of the initial steam available that enables the evaporator designer to vary the number of effects in order to obtain the best commercial return from the investment required for installing the evaporator. Primarily, the amount of waste exhaust steam available for returning to the evaporator should be determined. Providing there is a sufficient quantity of such steam, a single effect evaporator naturally makes not only the cheapest installation but also will show the best commercial return. If there is not sufficient exhaust steam to do the work in a single effect, there may be sufficient to do the work in a double or triple effect, or it may be that by supplementing the exhaust steam by means of a little live steam direct from the boiler the combined amounts of steam will be sufficient to do the work in a higher multiple effect. This is much better practice than to ignore the exhaust steam altogether,

Sufficient attention has not been given in the past to the question of using exhaust steam for evaporation in mills that require steam for both power and evaporation. The power plant engineer is usually out to obtain all the power he can by means of expansion engines and condensing the steam and has no sympathy for the evaporation department. Where the dual operations of making power from steam and of evaporation appertain, there is no question that the steam should be taken from the power engine in the shape of exhaust and furnished to the evaporator. The low-pressure steam gives but little benefit in power, even if used in a condensing engine, but because the latent heat is that used for evapor-

ating, this steam yields several times its power value if used in an evaporator. This statement holds even if the steam is used in a single effect evaporator, but is multiplied, according to the number of effects, if the steam is used in a multiple effect. This fact is becoming increasingly appreciated and it is now quite common practice to "bleed" steam from the high-pressure cylinder of the power engine in order to supply steam to the multiple effect evaporator. In other cases where that practice is not followed the condensing engine has been converted into a non-condensing engine, sending its exhaust steam to the evaporator. As the number of evaporator effects are usually less under such conditions, it naturally results in less expensive evaporator equipment as well as considerably lower working costs when the two operations of power and evaporation are considered. The ideal arrangement is, of course, where the steam from the mill engine power balances that required for evaporation work, because the combined fuel bill can be reduced by at least one-half compared with what it would be under the conditions of using a condensing engine for power and direct steam for working the evaporator.

Circulation an Important Feature

As the quantity of evaporation obtained per square foot of heating surface, other conditions being equal, depends upon the rapidity with which the liquor is circulated, that feature is a very important one to be considered when designing an evaporator. Too much prominence cannot be given to the matter of circulation in an evaporator, because on it not only depends the work done per square foot of heating surface but also its freedom from incrustation.

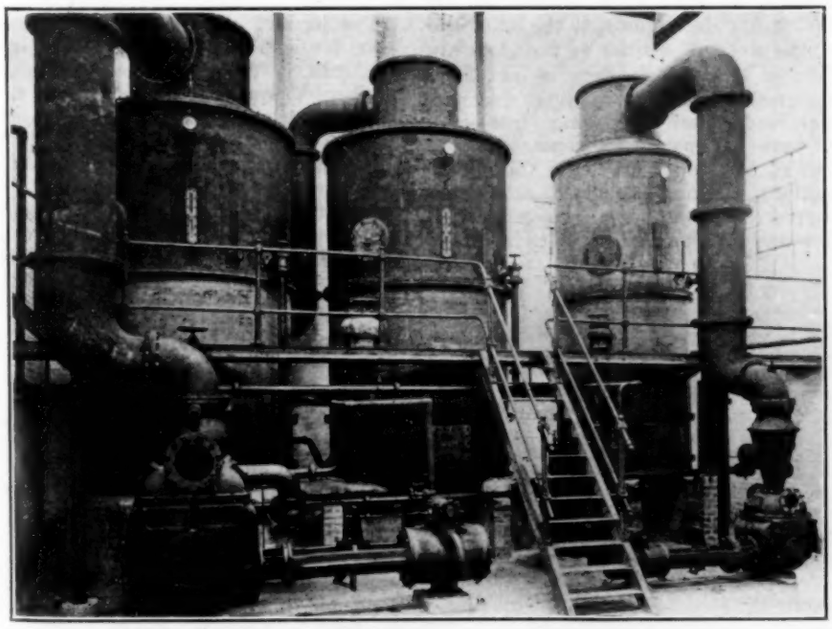
In operating an evaporator it is the usual custom to introduce the raw liquor to the first effect—that is, the evaporator which receives the steam supply—and to pass the liquor from effect to succeeding effect in parallel flow with the steam. In some cases, however, it is now the custom to introduce the raw liquor in the last effect and to pass it forward from effect to effect in reverse flow to that of the steam. In that case the theory is that the more concentrated the liquor becomes the higher is its boiling point. Therefore, counter-current flow will provide vapor of a higher temperature for evaporating the weaker lower boiling point liquor in the succeeding effects, thus achieving greater fuel economy.

The argument is perfectly true if the matter of fuel economy alone is the only thing to be considered, but an evaporation problem is not solely one of fuel economy. The possible volume of evaporation per square foot of heating surface also enters into the question in order to keep the size of the evaporator within such limits as will give a reasonable return on capital investment. It will readily be seen that in the reverse flow method, because liquors of a higher boiling point are contained in the first effects, the heat transmission cannot be as great as it would be if in those effects the liquid were of a lower boiling point. Moreover, with the reverse flow method the volume of evaporation obtained per square foot of heating surface cannot be so great as in the parallel flow method. Therefore the advantage sought by having liquors of a higher boiling point in the first effects is not altogether obtained and is offset by the fact that while the temperature of the vapors is somewhat higher they are not so great in quantity. Consequently, in order to do a given quantity of work the size of the evaporator, under the reverse flow method, must be greater than that when using the parallel flow method.

In other instances the highly concentrated liquor is contained midway in the effects — for instance, in a triple effect it is contained in the second effect and the raw liquor is used in the first effect and passed therefrom to the third effect and thence to the second effect. That method may be said to combine the advantages of both reverse flow and parallel flow methods. It is partly one and partly the other and obtains the greatest economy while requiring effects of only average dimensions. It will be appreciated, however, that reverse flow methods necessitate pumps to take the liquor from the later effects, which are under a higher vacuum, when passing it forward to the earlier effects, which have a lower vacuum. The cost of pumping, of course, reduces the fuel economy claimed for the reverse flow method over the parallel flow, because in the latter case no pumping is required.

The parallel flow method enables an evaporator of the smallest possible size to be used. The piping connections are also less complicated, and consequently this requires the lowest first cost of installation, so that the greatest net return, which after all is what is being sought, is obtained by the parallel flow method.

The subject of evaporation is a very important one and is frequently a complicated problem in chemical engineering because, while the principles involved may be substantially the same for every pulp mill, yet the supplies of steam, condensing water and waste heat available make it necessary for each mill to study the matter as its own individual problem.



A Triple-Effect Self-Circulating Type Evaporator Installation

Equipment News

From Maker and User

Small Size Pneumatic Hoist

Users of hoists will be interested in the new style size A, 500-lb. capacity pneumatic hoist which has just been placed on the market by the Ingersoll-Rand Co., 11 Broadway, New York City. This hoist, it is claimed, presents an improvement over past models in that it is more compact, requiring less head room, and also weighs much less. Regulation of the lifting and lowering speeds is obtained through a graduated throttle. If the air supply should fail, an automatic brake is provided to hold the load.

The motor is a balanced three-cylinder air motor which can be operated in either direction. It is geared to the hoisting drum. Both motor and gears are inclosed and thoroughly lubricated, as are the bearings. A safety stop is provided to prevent over-running the load.

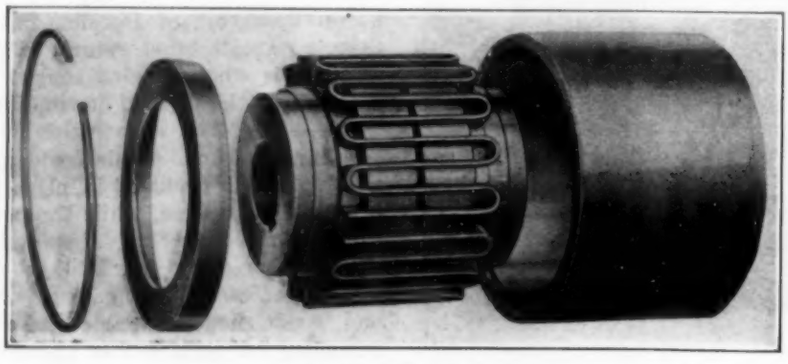
Flexible Coupling for Shaft

Some time ago the flexible coupling illustrated herewith was placed on the English markets under the "Bibby" patents. Having attained wide use in England, it has now been placed on the market in this country under the name of the Falk-Bibby flexible coupling and is manufactured by the Falk Corporation of Milwaukee, Wis.

The coupling, as can be seen from the illustration, consists of two flanged steel disks, one keyed to each shaft, a tempered steel spring bent into the form of a continuous cylindrical grid, and a steel shell. Pitched cross grooves are cut into the peripheries of the disks into which the spring is fitted. The shell is slipped over the spring to hold it in place, to protect it from dirt and injury, and to act as a container for lubricant. When the shell is in place, end plates are fitted into it and the whole mechanism is locked together by means of clamping rings, which are sprung into grooves in the shell.

Among the claims for this coupling are the shape of the spring and the shape of the slots into which the spring fits. In both flanges the slots widen inward, so that each section of the spring fits closely only at the outer end of the slot. The sides of the slots are formed to circular arcs of carefully designed radius. Under light and normal loads there is a long, free span between the points of contact on the spring, but under overloads the spring sections become supported along the curved sides of the grooves. This shortens the span and results in a progressive increase of stiffness with increase of load, while at the same time the stress on the spring segments remains constant. The stress on the spring is so limited, automatically, that the coupling will safely carry unusual overloads.

The form of construction used allows both torsional and lateral elasticity. The load is distributed over a large number of spring segments, with the result that the pressure on any one segment is comparatively light. Other advantages claimed for the coupling are convenience in assembling and disassembling, freedom from wear, compactness, elimination of end thrusts and oscillations and reduction of power losses.



Falk-Bibby Flexible Coupling

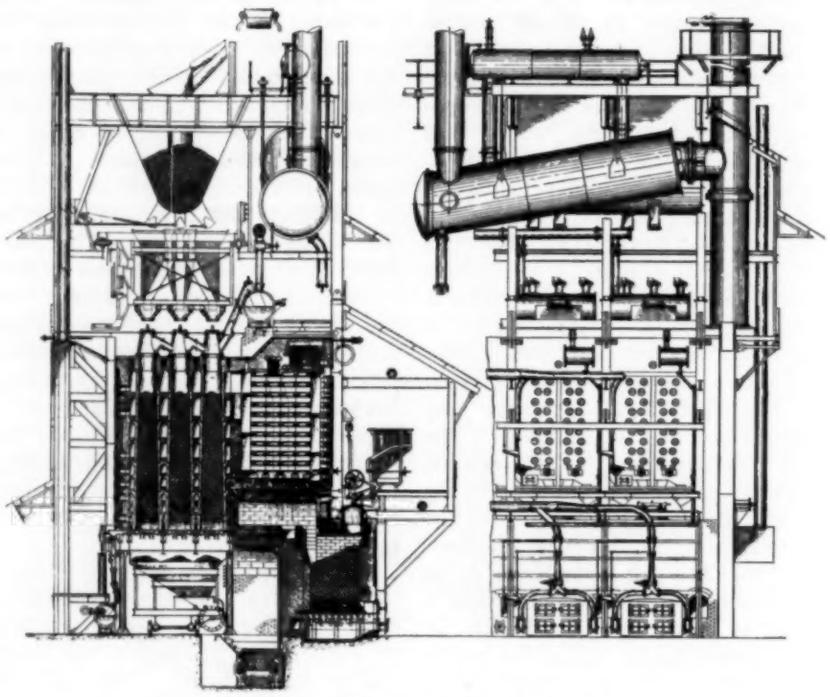


Fig. 1—Application of the Waste Heat Boiler
Typical cross-section and elevation of the U.G.I. intermittent type vertical retort system with waste heat boiler installed.

Waste Heat Boilers in Coal Gas Plants

At the recent convention of the American Gas Association at Atlantic City much attention was given to the exhibits of carbonizing equipment. One of the features that attracted attention was the use of waste heat boilers with vertical retorts. Such equipment has long been used with water gas installations, but its extended use in the coal gas field is of newer growth.

In Fig. 1 is shown the U.G.I. inter-

mittent type vertical retort system equipped with waste heat boiler. This gives a good idea of the method of installation used and the appearance of a retort bench where these boilers are used. In Fig. 2 is shown a chart for estimating roughly the large magnitude of heat savings which might be accomplished by use of such equipment with flue gases at various temperatures.

Maximum and Minimum Temperature Indicators

There has just been placed on the American market by the Heat Treating Equipment Co., of Boston, Mass., a little device which has been used in England for some years for maximum and minimum temperature indication in heat-treating steel which can probably be used to advantage in chemical industries where high temperatures are employed. It is aptly called a sentinel pyrometer and is the invention of Harry Brearley, a famous English metallurgist. This little indicator is merely a small cylinder of salt with a reliably definite melting point which is placed on a small saucer or, in the case of temperatures below 500 deg. C., in a glass tube. When it melts or freezes it indicates that the maximum or minimum allowable temperature has been reached.

The Brearley Sentinel Pyrometers, which are somewhat analogous to the well-known Segar cones which are used for indicating very high temperatures, are supplied at melting points from 220 deg. C. to 1,070 deg. C. at 5 or 10 deg. intervals, except between the temperatures of 340 and 600 deg. C., where there are only two (420 and 540 deg. C.). As these indicators cost only a few cents each in lots of fifty or one hundred, they can sometimes be applied where costly temperature-indicating instruments would be out of the question, but where an accurate maximum-minimum temperature indication would be of value.

Cleaning Gas Lines

As a new use for standard equipment, the General Carbonic Co. of New York is suggesting the use of its cylinders of liquefied CO_2 gas for cleaning stoppages out of pipes which carry combustible gases. Compressed air is dangerous if used for this purpose and the hand pump has generally been used for this purpose. CO_2 is inert and it is offered for this work as safe, efficient and economical.

Catalogs Received

C. J. TAGLIABUE MFG. CO., Brooklyn, N. Y.—Catalog 417. A catalog of the "Tag" line of laboratory thermometers and hydrometers. Catalog 905A—A catalog of the "Tag" line of recording and dial-indicating thermometers. Also a folder on the "Tag-Hespe" red reading thermometer column.

ADAM HILGER, LTD., London, England—A catalog on the X-ray spectograph (Dr. Müller's design) which is offered for purposes of chemical laboratory analysis.

RELIANCE ELECTRIC & ENGINEERING CO., Cleveland, O.—A booklet entitled "Electric Motors, How to Choose and Use Them," which contains much to interest the user of motors.

HENRY HEIL CHEMICAL CO., St. Louis, Mo.—New and revised issue of complete catalog of balances and weights for technical and scientific uses, containing prices revised to date and descriptions and illustrations of all types carried.

FERRO ENAMEL SUPPLY CO., Cleveland, Ohio.—A booklet entitled "The Story of a Pickling Prescription," which describes the use of the Marco Quick test Capsules, manufactured and distributed by this company and controlled by Marsh & Cochran, consulting engineers of Youngstown, Ohio. These capsules are for test pickling solutions in the steel pickling plant.

YOUNGSTOWN BOILER & TANK CO., Youngstown, Ohio—Bulletin 500. A catalog containing a description of the various standard tanks made by this company for storage of oils, tars, chemicals and similar materials and also various tables and other data of utility to the tank user.

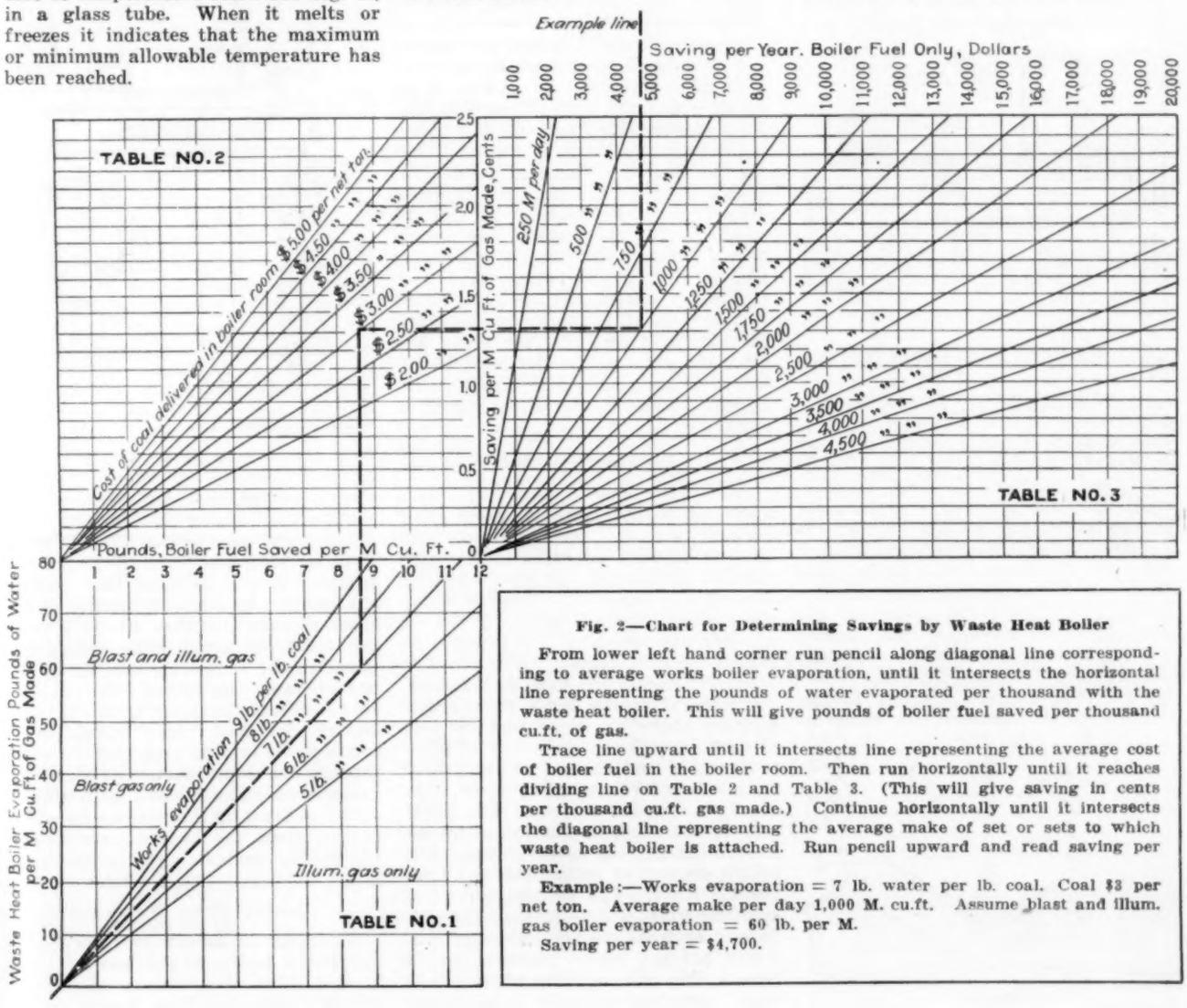

Example line
Saving per Year, Boiler Fuel Only, Dollars
1,000 2,000 3,000 4,000 5,000 6,000 7,000 8,000 9,000 10,000 11,000 12,000 13,000 14,000 15,000 16,000 17,000 18,000 19,000 20,000
TABLE NO. 2
Cost of coal delivered in boiler room $5.00 per net ton
$4.50 " " " "
$4.00 " " " "
$3.50 " " " "
$3.00 " " " "
$2.50 " " " "
$2.00 " " " "
Saving per M Cu. Ft. of Gas Made, Cents
2.5
2.0
1.5
1.0
0.5
0
250 M per day
500 " "
750 " "
1000 " "
1250 " "
1500 " "
1,750 " "
2,000 " "
2,500 " "
3,000 " "
3,500 " "
4,000 " "
4,500 " "
TABLE NO. 3
Pounds, Boiler Fuel Saved per M Cu. Ft.
1 2 3 4 5 6 7 8 9 10 11 12
Waste Heat Boiler Evaporation Pounds of Water per M Cu. Ft. of Gas Made
80 70 60 50 40 30 20 10 0
Blast and illum. gas
Blast gas only
Works evaporation 9 lb. per lb. coal
8 lb. " " " "
7 lb. " " " "
6 lb. " " " "
5 lb. " " " "
Illum. gas only
TABLE NO. 1

Fig. 2—Chart for Determining Savings by Waste Heat Boiler

From lower left hand corner run pencil along diagonal line corresponding to average works boiler evaporation, until it intersects the horizontal line representing the pounds of water evaporated per thousand with the waste heat boiler. This will give pounds of boiler fuel saved per thousand cu.ft. of gas.

Trace line upward until it intersects line representing the average cost of boiler fuel in the boiler room. Then run horizontally until it reaches dividing line on Table 2 and Table 3. (This will give saving in cents per thousand cu.ft. gas made.) Continue horizontally until it intersects the diagonal line representing the average make of set or sets to which waste heat boiler is attached. Run pencil upward and read saving per year.

Example:—Works evaporation = 7 lb. water per lb. coal. Coal $3 per net ton. Average make per day 1,000 M. cu.ft. Assume blast and illum. gas boiler evaporation = 60 lb. per M.

Saving per year = $4,700.

Review of Recent Patents

Drawing Continuous Sheet Glass

Typical Examples of the Inventive Effort Which Is Being Directed Toward the Development of Improved Equipment for Producing Sheet Glass

WITHIN recent years a great deal of attention has been given to the problem of drawing glass in continuous sheets. Some of the processes have already met with commercial success, but the search for improved methods still continues. And the production of sheets of plate-glass thickness is still a fertile field for investigation.

The following brief descriptions with their accompanying illustrations will give an idea of the trend of inventive effort in this interesting branch of the glass industry.

Drawing Through Clay Slot

It has been customary either to draw the sheet from a shallow receptacle fed from a continuous tank furnace or to

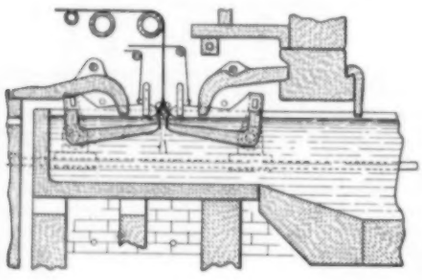


Fig. 1

draw directly from the rather deep body of glass at one end of the supply tank. Leonard D. Soubier, of Toledo, has combined some of the better features of each of these forms in the device shown in Fig. 1. A pair of opposing pivoted partition members, forming substantially the two halves of a shallow pot or receptacle, are mounted within the molten glass adjacent the upper surface thereof. These members may be tilted or swung about their pivots and also moved bodily toward or from one another by means accessible from outside the apparatus, and in this way the effective depth of the draw-pot is adjusted. The supply of glass to the interior of this shallow pot flows up

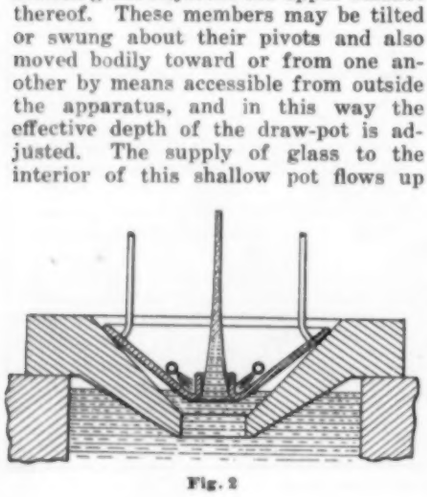


Fig. 2

through the slot or passage between the opposing pivoted members, directly beneath the line of draw of the sheet, thus insuring an even and equal feed to the sheet from both sides. At the same time the width or area of the slot or passage may be varied by adjusting the members about their pivots, or moving them toward or from one another. (1,463,273; assigned to Libby-Owens Sheet Glass Co.; July 31, 1923.)

Drawing Through Metal Slot

The use of an air-cooled metal slot or die placed above the clay slot is shown in Fig. 2, representing the invention of Halbert K. Hitchcock as disclosed in Patent 1,463,582, granted July 31, 1923, one-half being assigned to the Hitchcock Experiment Co.

In operating the device, the refractory member is positioned in the glass bath, after which the die member is put in place and the parts allowed to heat for a considerable length of time before the drawing operation is started. During this period of heating, air is preferably supplied through the pipes to prevent any overheating of the die member. The die member may also be heated before positioning it in the clay member. After the parts have been thoroughly heated and the glass in the slot arrives at a proper temperature, the bait is dipped into the glass, and after the glass in the slot becomes adherent to such bait, it is drawn slowly upward, forming the glass sheet as illustrated.

Drawing the Sheet

The base of the sheet is firmly anchored to the body of glass lying beneath the die member and such body is in turn adherent to the submerged portion of the clay member. The sides of the sheet are pulled across the highly polished surfaces of the die member and smoothed and polished by reason of such contact. The sheet is relatively thick at its base, as indicated, but remains plastic for a considerable distance above the glass, and the rate of draw is such that this body of glass is stretched and thinned to the proper thickness before the glass cools sufficiently to harden and set. The thickness of the sheet is determined by the size of the die, the speed of draw, and by the amount of cooling secured from the air pipes. The process serves to give the glass a fine surface substantially free from the vertical lines ordinarily present where glass is pulled from a clay slot, and the edges of the sheet are automatically maintained against pulling in and so narrowing the sheet, the anchoring means serving to counteract any tendency of the edges to pull away from the ends of the slot.

Gripping Only Sides During Drawing

Fig. 3, representing an invention of Robert P. Callard, of Charleston, W. Va., is almost self-evident. Each edge of the glass sheet is gripped by a pair of endless chain devices so mounted on truck bases that sheets of different widths may be drawn. Beneath these devices are knurled edge-forming rollers, between which the edge portions are rolled and fed up from the molten glass. These rollers are driven at a peripheral speed somewhat less than the linear speed of the chains so that a stretching action will be exerted on the sheet.

The drawing of the sheet is initiated by lowering a suitable bait into the molten mass and slowly pulling this bait and attached sheet up and through the drawing mechanisms. The bait is

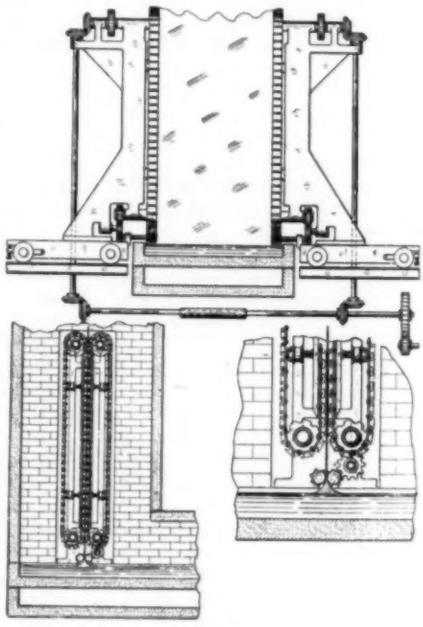


Fig. 3

then detached, and the sheet will be continucusly drawn up through these devices, and may be cut off, in the desired sections, above the drawing mechanisms. It will be noted that nothing engages the central body portion of the sheet at any time, thus always leaving the sheet unmarred and entirely exposed to the tempering actions of the heated gases thereabout. It will also be noted that the drawing mechanisms engage the sheet edges throughout a considerable vertical area, and the sheet through the upper portion of this area becomes hard and set so that it acts as a bait to draw up the continually added portion from the molten mass below. (1,469,380; assigned to Libby-Owens Sheet Glass Co.; Oct. 2, 1923.)

Flowing Glass Downward

According to Joseph P. Crowley, of Toledo, the failure of previous attempts to flow glass downwardly through a slotted former, has been largely due to

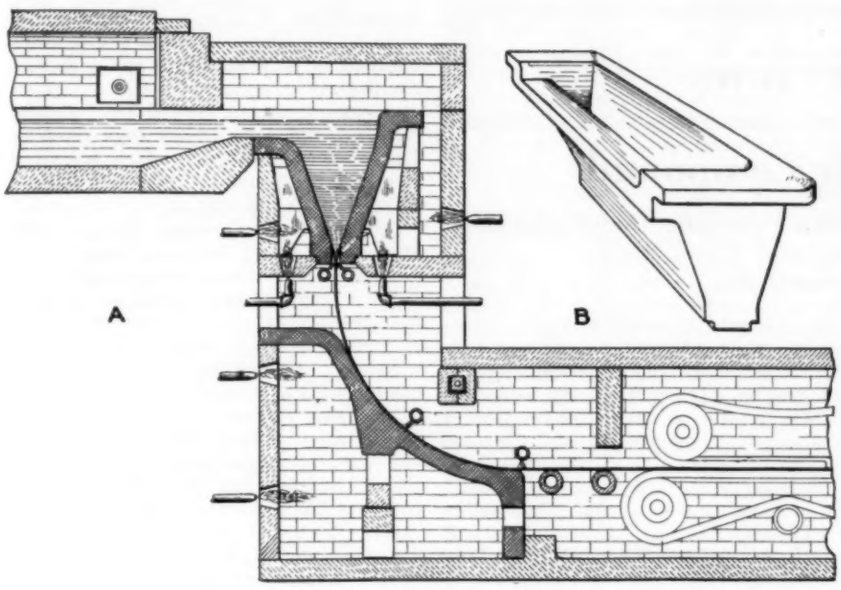


Fig. 4

the tendency of the hot glass to adhere to the walls of the container and the sides of the slot, and as this glass cools it forms so-called "dog-metal," which obstructs the opening and causes lines and other defects in the sheet.

This difficulty may be largely obviated by forming the slotted hopper or receptacle, through which the molten glass flows into sheet form, of graphite-clay or a similar composition, to which the hot glass will not adhere but over which it freely slides without injury to the surfaces of the molten glass as it takes sheet form.

The same graphite-clay mixture is used in the curved heated slab over which the hanging arc of the glass sheet slides into a horizontal position without being scratched or otherwise injured. The assembled mechanism is shown in Fig. 4 *A*, the construction of the hopper being indicated in *B*, (1,469,383; assigned to Libby-Owens Sheet Glass Co., of Toledo, Ohio; Oct. 2, 1923.)

Flowing Glass Over Itself

Instead of flowing glass over a block of some other material, Robert M. Corl, of Maumee, Ohio, utilizes a cooled surface of the glass itself. As shown in Fig. 5, glass flows from a tank to form a continuous ingot of rectangular cross section which is cooled so that it will run of its own weight over inclined rollers. The forward edge of this ingot is melted by suitable burners so that the glass flows down over itself to form a horizontal sheet. (1,465,347; assigned to Erie Glass Co.; Aug. 21, 1923.)

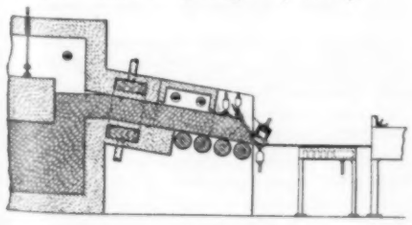


Fig. 5

Acetylene-Aldehyde Condensation Products

Reaction Yields Fusible Gum Which May Be Further Treated to Form Infusible Resin

Attempts have been made to harden acetylene resin (a condensation product of phenol and acetylene) with paraldehyde, but the reaction must take place in the presence of an acid catalyst, which confers objectionable properties upon the material. Emil E. Novotny, of Logan, Pa., and Donald S. Kendall, of Glen Ridge, N. J., describe a solution of the problem in Patent 1,470,637, granted Oct. 16, 1923, and assigned to John S. Stokes, of Huntingdon Valley Post Office, Pa.

The mixture consists of 100 parts by weight of phenol-free phenol acetylene resin containing ½ part of sulphuric acid and 8 parts of paraldehyde. The resin is first heated to 260 deg. F. in a jacketed autoclave and the paraldehyde added while stirring and cooling. After the reaction is complete, sufficient ammonia is added to neutralize the acid catalyst, and the neutral resin purified by steam distillation.

The resultant fusible gum now has the characteristics of a dry, friable, grindable shellac-like material, which may be heated for any length of time without undergoing a further reaction, or in other words, is permanently fusible and is soluble in the well-known resin solvents such as alcohol or acetone. At this stage it may be used for various molding purposes where such materials as shellac are now used, as for instance in the manufacture of buttons or of the ordinary well-known type of fusible sound records, and is therefore useful because of its cheapness and because it may be remolded or recast any number of times in the same manner as shellac is now handled.

By grinding this fusible material in a burr grinder or ball-mill to a finely comminuted powder, it may be mixed with various fillers such a rotten-stone, cotton-flock, wood-flour, cellulose, lampblack, etc., to be formed into powder or rolled into plastic sheets for use in the manufacture of such materials as sound records, buttons, etc., and being permanently fusible, is inexpensive from the standpoint of re-use of previously cast articles.

By utilizing this powdered comminuted material and mixing therewith from 5 to 10 parts of a hardening agent such as hexamethylene-tetramine as in a suitable ball-mill and introducing therewith any desired fillers and lubricants, there is formed a potentially reactive material of long keeping qualities which may be molded under heat and pressure to form finely polished, accurately dimensioned, final infusible reaction products at temperatures of from 200 to 400 deg. F. for a period of from 1 to 10 minutes.

Calendar

American Association for the Advancement of Science, seventy-fifth anniversary meeting, University of Cincinnati, Cincinnati, Ohio, Dec. 27 to Jan. 2.

American Ceramic Society, Atlantic City, N. J., Feb. 4 to 9, 1924.

American Chemical Society, regular meeting, Rumford Hall, Chemist's Club, New York, Jan. 4, 1924.

American Face Brick Association, French Lick Springs Hotel, French Lick, Ind., Dec. 4 to 6.

American Institute of Chemical Engineers, winter meeting, Washington, D. C., Dec. 5 to 8. Headquarters at the Willard Hotel.

American Petroleum Institute, fourth annual meeting, Statler Hotel, St. Louis, Mo., Dec. 11 to 13.

American Society of Heating and Ventilating Engineers, annual meeting, New York City, Jan. 22 to 25, 1924.

American Society of Mechanical Engineers, annual meeting, New York City, Dec. 3 to 6.

American Society of Refrigerating Engineers, annual convention, New York City, Dec. 3 to 5.

American Society of Safety Engineers, annual meeting, New York City, Jan. 18, 1924.

Canadian National Clay Products Association, Prince George Hotel, Toronto, Ont., Feb. 13 and 14, 1924.

Coal Mining Institute of America, annual meeting, Pittsburgh, Pa., Dec. 19 to 21.

Common Brick Manufacturers' Association, Biltmore Hotel, Los Angeles, Calif., Feb. 11 to 14, 1924.

Engineering Institute of Canada, annual general meeting, Montreal, Jan. 22, and Ottawa, Jan. 23 and 24, 1924.

Federated American Engineering Societies, annual meeting, Washington, D. C., Jan. 10 and 11, 1924.

Franklin Institute, annual meeting, Philadelphia, Jan. 16, 1924.

National Association of Practical Refrigeration Engineers, fourteenth annual convention, Memphis, Tenn., Dec. 12 to 16.

National Exposition of Power and Mechanical Engineering, Grand Central Palace, New York, Dec. 3 to 8.

New Jersey Clay Workers' Association and Eastern Section American Ceramic Society, annual meeting, New Brunswick, N. J., Dec. 19.

Society of Automotive Engineers, annual meeting, simultaneously with the Detroit Automobile Show, General Motors Bldg., Detroit, Mich., Jan. 22 to 25, 1924.

Society of Chemical Industry, Perkin medal award, Rumford Hall, Chemists' Club, New York, Jan. 11, 1924.

Book Reviews

Metals and Their Compounds

An Interpretation of the Fundamental Principles Underlying the Technology of the Metals and Their More Important Compounds

METALS AND METALLIC COMPOUNDS. By *Ulick R. Evans.* Vol. I, 468 pp., illus., price $7; Vol. II, 396 pp., illus., price $6; Vol. III, 270 pp., illus., price $4.75; Vol. IV, 350 pp., illus., price $6. Longmans, Green & Co., New York.

However frequent the appearance of new textbooks, few will dispute the contention that information in general on fundamental fact is not easy to obtain. The facility to present data in condensed form, avoiding the non-essential and stressing the important, is possessed by but a few scientific writers. Furthermore, although the laborer may be deemed worthy of his hire, the writer on technical and scientific subjects must realize early in his career that no adequate monetary recompense will be forthcoming to compensate him for the research incidental to authorship. His effort, if it is to be successful, must spring from a devotion to the scientific ideal. It is only by accepting this fundamental assumption that one can explain the appearance of this monumental work.

As the author mentions in the preface, so much advance has occurred in recent years in metallography, crystallography, electrochemistry and geochemistry, and so much information is available to those who have the leisure to keep in touch with all that has been written on these subjects in technical and scientific journals, that it is possible to approach the subject of metals and metallic compounds in a new light. It is pointed out that much information of considerable value and direct bearing on the subject under discussion has appeared in journals not devoted to chemistry; and many interesting features have thus escaped the attention of writers of textbooks.

To quote a few examples of how this has been remedied by the author: By the inclusion of a description of a new process for the manufacture of magnesium which appeared originally in the *Electrician;* a discussion of the use of charcoal as an adsorptive agent in the precipitation of gold from aurocyanide solutions, originally published in the transactions of a mining engineering society; a suggestion as to the possible value of an alloy of cobalt and cadmium for the manufacture of electric-furnace elements, from the *Iron & Coal Trades Review;* and a reference to a description of a quicksilver furnace described in a bulletin issued by the State Mining Bureau of California.

An assiduous search for reliable evidence and data has been made by the author, and he is to be congratulated on having prepared the résumé in compact and readable form. Strict uniformity of presentation is evident in all four volumes. Abstracted matter has been condensed and standardized with a view to economy of words used and ease of presentation. Due credit is given to the original investigator as well as to the publication, but this information is confined to footnotes; the author explains that he has written a book about chemistry, not about chemists.

Mr. Evans' intimate knowledge of the subjects on which he writes makes him well fitted to compile a précis of the available literature. Those who have kept abreast of modern research will recall his frequent contributions to the literature of physical and colloidal chemistry, the structure of metals, electrochemistry and analytical research, copper, zinc and lead. Prospective readers of the four volumes under review will therefore be relieved to learn that, when discussing controversial points, he has in most instances departed from the usual custom of giving merely a summary of the views of

American Patents Issued November 13, 1923

The following numbers have been selected from the latest available issue of the *Official Gazette* of the United States Patent Office because they appear to have pertinent interest for *Chem. & Met.* readers. They will be studied later by *Chem. & Met.'s* staff, and those which, in our judgment, are most worthy will be published in abstract. It is recognized that we cannot always anticipate our readers' interests and accordingly this advance list is published for the benefit of those who may not care to await our judgment and synopsis.

1,473,616—Retort for the Distillation of Shale, Bituminous Coal and Other Materials. Claude M. Garland, Chicago, Ill.

1,473,641—Process of Dry Distilling and Carbonizing Crude Peat. Otto Pohl, Planegg, near Munich, Germany.

1,473,665—Furnace. Edmond Berthelon, Ax-les-Thermes, France.

1,473,675—Glazing Machine. Hans N. Halvorsen, Vineland, N. J., assignor to Kimble Glass Co., Chicago.

1,473,722—Furnacing Process. Carl S. Fogh, Philadelphia, Pa., assignor to Ore Roasting Development Co., Philadelphia.

1,473,723—Method of Producing Elemental Sulphur. Carl S. Fogh, Philadelphia, Pa.

1,473,734 — Centrifugal Emulsifier. Christian F. Paul, Jr., Austin, Tex., assignor to Ernest Nalle, W. P. Allen and Ed Rosengren, trustees, all of Austin.

1,473,750—Purification of Waste Liquors. Fred W. Wagner, Pittsburgh, Pa.

1,473,791 — Apparatus for Forming Clay Pots. Claude H. McCutcheon Kittanning, Pa., assignor to Pittsburgh Plate Glass Co.

1,473,806—Apparatus for Separating Tar From Gases. Linn Bradley, East Orange, N. J., assignor to Research Corporation, New York City.

1,473,825—Explosive for Use in Blasting Caps. John Marshall, Swarthmore, Pa., assignor to E. I. du Pont de Nemours & Co., Wilmington, Del.

1,473,826—Method of Fixing Nitrogen. Floyd J. Metzger, New York City, assignor, by mesne assignments, to California Cyanide Co.

1,473,831—Furnace. Charles N. Morrison, Midland, Mich., assignor to Dow Chemical Co., Midland.

1,473,853 — Refractory Article and Method of Making Same. William A. Harty, Buffalo, N. Y., assignor to Exolon Co., Boston.

1,473,879—Method of Manufacture of Sulphuric Acid. Ferdinand A. Rudolf, Jamaica, N. Y., and James C. Ryder, Passaic, N. J.

1,473,887—Method of Making Brominated Indigos. Charles J. Strosacker and Howard J. Rupright, Midland, Mich., assignors to Dow Chemical Co., Midland.

1,473,899—Method of Preserving Wood. Friedrich Bodmar, Ostbahn, near Berlin, Germany.

1,473,958 — Apparatus for Conveying Plastic Material. Morris R. Johnson, Birmingham, Ala.

1,473,966—Process of Manufacturing a Composition Containing Anhydrous Magnesium Chloride. Ichitaro Namari, Sakai, Osaka Fu, Japan, assignor to Minami Manshu Tetsudo Kabushiki Kaisha, Tairen, Kwanto Shu, China.

1,474,012 — Complete Gasification of Solid Fuel. Charles W. Andrews, Duluth, Minn.

1,474,019—Method and Apparatus for Forming Glass. Robert M. Corl, Maumee, Ohio, assignor, by mesne assignments, to Erie Glass Co., Toledo, Ohio.

1,474,035—Process of Making Mesityl Oxide, Etc. Alfred Hoffman, Kew Gardens, N. Y., assignor to Alco Deo Co., Wallington, N. J.

1,474,058—Leer for Annealing Glassware. David Stenhouse, Clarksburg, W. Va.

1,474,063—Tunnel Kiln. George W. Booth, Islington, Ont., Canada.

1,474,120—Decolorizing Material and Process of Making Same. Hugh Rodman, Oakmont, and Earl E. Boren, Swissvale, Pa., assignors to Rodman Chemical Co.

1,474,135 — Liquid Fuel for Motors. Arthur A. Backhaus, Baltimore, Md., assignor to U. S. Industrial Alcohol Co.

1,474,136 — Process of Treating Oils. Frederick W. Bayard, Chester, Pa., assignor to E. I. du Pont de Nemours & Co., Wilmington, Del.

1,474,147 — Distilling and Cracking Petroleum. John Lathrop Gray, Elizabeth, N. J.

1,474,151—Electrode for Ion Concentration Effects. Earl A. Keeler, Norristown, Pa., assignor to Leeds & Northrup Co., Philadelphia.

1,474,216 — Production of Alcohol. Joseph Van Ruymbeke, Marseilles, France.

1,474,259—Extracting Moisture From Plastic Material. Jacob Hess, Ebertsheim, Germany, assignor to Robert J. Marx, London, England.

Complete specifications of any United States patent may be obtained by remitting 10c. to the Commissioner of Patents, Washington, D. C.

those who differ, realizing that this practice may leave the student hopelessly bewildered. Mr. Evans suggests a standpoint that may be adopted by the average reader as a working hypothesis, with the idea that further research will ultimately decide the point under dispute.

The first volume summarizes the elementary principles of general chemistry, physics and geology, and contains a detailed study of metallography and electrochemistry. The author, in passing, notes the "barbarous" character of the nomenclature used in electrochemical literature. He compromises, and selects a terminology that is definite, "even if it is not dignified."

Volumes II, III and IV deal with the metals and their compounds. The subjects are discussed in logical sequence: (1) pure chemistry; (2) terrestrial occurrence, and (3) technical practice and developments. Metallurgical and chemical methods sometimes change so rapidly that it is difficult for an unattached observer to reflect correctly current practice; some of Mr. Evans' comments and conclusions in consequence are open to question by specialists. But it will be pertinent to point out from personal knowledge that he welcomes suggestions from those who are in close touch with operating conditions, with a view to the avoidance of minor misstatements in the next edition. The compilation of a treatise of this character involves vast labor, unremitting care and zeal. Chemists and metallurgists can help themselves and their confréres, as well as the profession they serve, by co-operating.

From a detailed study of the four volumes it would appear that the author has succeeded remarkably well in his attempt "to correlate cause and effect, and to introduce such theoretical views as will serve to connect the known facts in an ordered and elegant sequence." As intended, the books will no doubt prove of signal value for the advanced student of inorganic and metallurgical chemistry, for those engaged in research and for the industrial chemist; as an encyclopedia on a subject in which few technologists have no interest nor concern, "Metals and Metallic Compounds" should find a place on every technical bookshelf.

A. W. ALLEN.

Survey of Alloy Steels

SPECIAL STEELS. By *Thomas H. Vernon*, founded on the researches of Sir Robert Hatfield, B.T. 153 pp., illustrated. London: Sir Isaac Pitman & Sons, Ltd. Price, 5 shillings.

The make-up of this book is similar to "Metallurgy of Iron and Steel" and also based on Sir Robert Hatfield's researches, published some time ago by the same house. In the foreword to "Special Steels" Sir Robert Hatfield speaks of the seriousness of the wastage of iron due to corrosion. He points out that during 1921 the amount of steel and iron ruined by corrosion was almost as great as the pig iron produced, though much of the waste was, of course, recoverable as scrap. The single property corrosion resistance of many of the alloy steels would be of very great importance even if these steels did not have other remarkable and valuable properties. The number of new alloys is very great and their physical characteristics are also very numerous. Though the book is small, it is complete enough to make possible a rapid survey of alloy steels in use at present time. The general line of the manufacture of such steels is described and then a chapter is devoted to the properties and manufacture of each special class of steel, including nickel, chromium, silicon, manganese, tungsten steels, and steels containing combinations of these elements. C. B. BELLIS.

Glue and Gelatin

GLUE AND GELATIN. By *Jerome Alexander*. 236 pages. Chemical Catalog Co., New York, 1923. American Chemical Society Monograph. Price, $3.

This is an excellent book, well worth the attention of leather chemists, colloid chemists, physiological chemists and all other kinds of chemists. It is far from being a mere technical treatise. On the contrary, fundamental theories pertinent to the subject are given great prominence.

Alexander's book is no encyclopædic compilation. He puts personality into it, writing in a style that is clear and attractive. Both sides of debated questions are presented fairly. For example, although the author does not agree with the conclusions of Jacques Loeb, he devotes many pages to that investigator's work. He denies the existence of Loeb's sodium gelatinate and gelatin chloride, partly because he (Alexander) does not believe that gelatin is a definite substance. There is discussion of the alleged crystallization of gelatin by von Weimarn and Bradford. This is a vital issue with Loeb, who builds his work upon the theory that gelatin can be purified as a definite compound, and, in the case of egg albumin and edestin, can be crystallized. Alexander asks the disturbing question, "Why does deaminized gelatin give practically the same results as ordinary gelatin with Loeb's experiments?" He also mentions Bancroft's contention that adsorption of hydrogen ion will explain Loeb's p_H curves.

The actual processes of tanning are only briefly dealt with in one short chapter, but this was not meant to be a hand-book. As stated in the preface, "The theoretical aspect has been treated more at length than has been usual with books on glue, for a more complete understanding of the nature of a product must in the end be useful to its makers and users." To quote the author further:

"The manufacture of glue and gelatin is important, not only because of the magnitude of the industry itself, but also because these products are essential to the production of many others, thus making it a key industry. Furthermore, glue and gelatin are typical jelly-forming colloids and they have been used in numberless experiments on and investigations into the nature of colloids. For the same reason, a discussion of the behavior of glue and gelatin involves the consideration of many moot points in colloid chemistry and gives the subject an interest rather broader than the title would indicate."

Among the topics discussed are: Position of gelatin among the proteins; chemistry, physical chemistry and colloidal chemistry of glue and gelatin; structure of gelatin solutions and jellies; swelling of gelatin; Donnan's theory of membrane equilibrium; Hofmeister series; viscosity; collagen or ossein; effect of tanning substances on glue and gelatin; chemical examination of glue and gelatin; technology and uses of glue and gelatin; testing and grading; fish glue and isinglass.

Not only has Alexander had long experience in the manufacture of glue and gelatin, but he has devoted years to the study of the theories involved. He writes with authority.

HARRY N. HOLMES.

Books Received

Gas Producer Engineering

MODERN GAS PRODUCERS. By *N. E. Rambush*. 545 pages, 356 illustrations. 83 tables. Benn Bros., Ltd., London, price, 55 shillings. D. Van Nostrand Co., New York. Price, $15.

With the increasing use of producer gas in industry there has developed a real need for a comprehensive up-to-date treatise on the design, construction and operation of gas producers. This need is met to a most satisfying degree by Mr. Rambush's detailed treatment, which emphasizes the engineering phases without neglecting the important fundamental factors in producer practice.

Chemical Engineering of Gas Manufacture

GAS MANUFACTURE. By *W. B. Davidson*. 464 pages, illustrated. Longmans, Green & Co., New York. Price, $7.

In this book the subjects of gas engineering and gas supply are treated very fully from the chemical engineering standpoint, with the intention of pivoting the foundations for a sound knowledge of the production and distribution of manufactured gas.

Wood Distillation

WOOD DISTILLATION. By *L. F. Hawley*, in charge, Section of Derived Products, Forest Products Laboratory. 141 pages, illustrated. Chemical Catalog Co., New York Price, $3.

This is the first book in English to cover modern practice in both hardwood and resinous wood distillation, and will accordingly be welcomed by

those in the industry as well as all chemical engineers desirous of keeping in touch with modern technology.

New Publications

TAG MANUAL FOR INSPECTORS OF PETROLEUM. Edited by R. M. Wilhelm. Eighteenth revised edition. Published by C. J. Tagliabue Mfg. Co., Brooklyn, N. Y. Price $1. This manual is already too well known to petroleum technologists to require comment as to its usefulness. In this revision, however, so many additional data regarding properties and testing methods have been included that the publication might well be regarded as a handbook for the oil industries. The testing methods with a few exceptions are those adopted as tentative standards by A.S.T.M. or by the U. S. Interdepartmental Committee on Petroleum Specifications. By the publication of "Revised Gravity Temperature Correction Table" is marked one of the last steps in the long-standing controversy between the oil industry and the Bureau of Standards. The latter's final acceptance and approval of the 141.5 modulus to be known as the A.P.I. (American Petroleum Institute) scale has met with the wide approval of the industry. The new tables given in this manual have been extended to include temperatures as low as 0 deg. F. and as high as 195 deg. F. for certain gravities. The hope is expressed that the transfer from the old to the new tables can be made by the industry without serious inconvenience.

Journal of Scientific Instruments is the name of a new monthly publication, which the Institute of Physics is producing with the co-operation of the National Physical Laboratory, the first issue of which appeared in October, 1923. The purpose of the *Journal* is to describe methods of measurement and the construction and use of instruments used in all branches of scientific and technical work. Copies may be obtained from the Institute of Physics, 10 Essex St., London, W. C. 2, England.

PETROLEUM AND ALLIED PRODUCTS is the title of a new publication issued by the Imperial Mineral Resources Bureau, which gives statistics from 1919-1921. Copies can be obtained from H. M. Stationery Office, Imperial House, Kingsway, W. C. 2, London, England, at 7s. 6d. net.

Men in the Profession

R. L. AGASSIZ, president of the Calumet & Hecla Consolidated Copper Co., New York, has been again elected president of the Copper and Brass Research Association.

A. W. ALLEN, assistant editor of *Chem. & Met.*, with headquarters at San Francisco, is spending several weeks in the head office in New York.

J. W. AUTREY of Dallas, Tex., has been elected president of the Dallas Paint, Oil and Varnish Club for the ensuing year. WESLEY NORRIS was elected vice-president and J. G. C. CREAL secretary and treasurer.

G. S. BROWN, president of the Alpha Portland Cement Co., Easton, Pa., gave an instructive address before the members of the local Rotary Club at the Karldon Hotel, Nov. 15, on the subject of the "Cost of Distribution."

Dr. C. A. BROWNE, chief of the Bureau of Chemistry, United States Department of Agriculture, Washington, D. C., now on an inspection tour of the laboratories and field work of the bureau, has left New Orleans, La., and vicinity for Western districts, following a week's stay in that district, devoted mainly to the inspection of sugar territorial work. On Nov. 7, with Dr. R. E. Doolittle, chief of the central district of the bureau, he was a guest of honor at a dinner given by the Louisiana Section of the American Society, at New Orleans.

ARTHUR P. DAVIS, past president of the American Society of Civil Engineers, who was summarily dismissed as director of the Reclamation Service by Secretary Work, has been elected to honorary membership by the Washington Society of Engineers. This honor has been conferred on only four others. They are: Secretary of Commerce Hoover, Admiral H. T. Endicott, Admiral D. W. Taylor and Dr. F. H. Newell. Mr. Davis is now in England, representing the Department of State on engineering matters coming before the Pecuniary Claims Commission.

LEWIS A. DEBLOIS, formerly head of the safety section of E. I. du Pont de Nemours & Co., Wilmington, Del., first president of the Delaware Safety Council and recently elected president of the National Safety Council, was the guest of honor at a dinner at the Hotel du Pont, Wilmington, Nov. 9, given by members of the Delaware Safety Council and city officials. The principal speaker of the evening was John A. Cartel, chief of the safety department of the Carnegie Steel Co., Pittsburgh, Pa. Joseph H. Martin, president of the Delaware Safety Council, presided.

JUNIUS D. EDWARDS, assistant director of research of the Aluminum Co. of America, spoke on "Aluminum Bronze Pigments," at a meeting of the Detroit Paint and Varnish Production Men's Club on Nov. 13.

E. G. HARCKE of New York, consulting engineer of oxy-acetylene welding and a member of the industrial engineering department of the Air Reduction Sales Co., spoke before the members of the Purchasing Agents' Association of Buffalo, N. Y., Nov. 14, on the subject, "Oxygen."

B. B. HOOD, formerly assistant works superintendent of the U. S. Metals Refining Co., is now works engineer at the Western Electric Co.'s plant at Kearny, N. J.

H. L. HUMES, formerly a member of the faculty at McGill University, is now on the investigation staff of the Copper Queen Smelter of the Phelps Dodge Corporation, Douglas, Ariz.

P. W. LITCHFIELD, vice-president and factory manager of the Goodyear Tire & Rubber Co., Akron, Ohio, addressed the employees of the company at a meeting at Goodyear Hall, Nov. 16, on the subject of "Developing Airplanes and Tires."

Dr. JOHN A. MATHEWS has resigned as president of the Crucible Steel Co. of America, to devote his entire attention to the company's research work in the field of metallurgy.

D. S. MCAFEE and S. G. HILL of the Dorr Co. left New York Nov. 17 for a trip through the Middle West, expecting to return about Jan. 1. Mr. Hill is a sanitary engineer of note in England and is spending 6 months in this country studying American methods of handling sewage. He will represent the Dorr Co.'s interests in sanitary engineering in England after completing his visit in this country.

S. H. MCCRORY, chief of the Division of Agricultural Engineering, U. S. Department of Agriculture, has been elected president of the American Society of Agricultural Engineers.

R. B. MELLON of Pittsburgh, Pa., has been elected a director of the Crucible Steel Co. of America, with headquarters in that city.

Rear Admiral WILLIAM A. MOFFETT, U. S. N., Chief of the Bureau of Aëronautics, Navy Department, Washington, D. C., spoke at the Franklin Institute of the State of Pennsylvania, Nov. 21, on "ZR-1, the First Helium-Filled Rigid Dirigible."

FRANCIS R. PYNE, who was formerly works superintendent for the U. S. Metals Refining Co., Carteret, N. J., is now connected with the Nichols Copper Co., Laurel Hill, N. Y.

ALEXANDER SMITH of Chicago, at a meeting of directors of the Abitibi Power & Paper Co., Ltd., was elected president of the company, replacing F. H. Anson, who died recently.

PAUL SMITH, formerly chemical engineer with the Obannon Co. of West Barrington, R. I., has been placed in charge of development and research work with the Duratex Corporation, manufacturer of coated fabrics, at Newark, N. J.

L. W. SUTHERLAND, president of the Sutherland Paper Co., Kalamazoo, Mich., has been elected a director of the local Chamber of Commerce.

J. E. UNDERWOOD has resigned his position as research chemist with the Radium Emanation Corporation, to join the staff of the National Lime Association as assistant chemical director.

JOHN MORRIS WEISS of Weiss & Downs, New York, was in New Haven Nov. 16, attending the meeting of the benzol poisoning committee of the National Safety Council.

Obituary

ELOF HERMAN MEDEN, chief engineer of the American Gas Accumulator Co., Elizabeth, N. J., died at his home at Short Hills, N. J., on Nov. 9, following a short illness, aged 56 years. He was born in Sweden and came to this country in 1893. He is survived by his wife, four sons and two daughters.

News of the Industry

Summary of the Week

Chemical Equipment Association adopts a code of ethics governing conduct of business.

General expansion in evidence throughout pulp and paper industry.

Oliver Filter Co. absorbs Portland Filter rights.

Senator Ladd and Representative Madden back Ford's Muscle Shoals offer.

Southern Congressmen may seek legislation authorizing Secretary of Agriculture to place long-term contracts for arsenic.

German manufacturers will resume production of dyes in the Ruhr.

New chemical plant in Mexico will produce caustic soda and bleaching powder.

All grades of pure and denatured alcohol have been marked up 4c. per gallon.

Monopoly in control of citrate of lime in Italy has not operated successfully.

Belgian glass industry is in flourishing condition with active call for plate glass.

Southern Congressmen Work on Plan to Secure Maximum Output of Arsenic

May Propose Legislation Authorizing Secretary of Agriculture to Make Long-Time Contracts for Arsenic or Calcium Arsenate

PURCHASES of calcium arsenate and of nitrate of soda will be discussed in Washington Nov. 30 at a meeting of Southern members of the House of Representatives called by Representative Lowrey of Mississippi. Representative Lowrey is understood to favor the reviving of legislation proposed at the last session of Congress under which the Secretary of Agriculture would be authorized to make long-time contracts for white arsenic or calcium arsenate. It is believed by some members of Congress that some such plan must be worked out if the maximum production of arsenic is made available at the earliest possible time.

At the conference on Nov. 30, Representative Wilson of Louisiana expects to advocate the making of contracts for calcium arsenate by farmers' co-operative associations. There apparently is general appreciation of the fact that long-time contracts will do more to stimulate production than any other single step.

Arsenic Committee to Meet

It is also announced that an early meeting will be held of the arsenic committee, which is composed of representatives of the Geological Survey, the Bureau of Entomology, the producers, manufacturers and consumers of arsenic and arsenic compounds. It is expected that the committee will be able to assemble early in December to discuss the general prospects for the coming season.

Greater prominence will be given to these meetings because of the recent report issued by the Department of Commerce in which the cotton crop was estimated at 9,500,000 bales. In the estimate made in July the crop was placed at 12,500,000 bales, but this figure has been scaled down in later estimates, with unfavorable weather and crop damage figuring prominently in the successive reports. Acreage abandoned was in excess of 5 per cent of the total planted, which is a record for the industry. One of the recent reports of the government characterized the ravages of the boll weevil in the cotton-growing sections as "exceptional," the heaviest damage being reported in Georgia, with heavy loss in the lower parts of the Gulf states east of the Mississippi River.

The heavy losses to cotton growers in recent years may be indicated by reference to statistics of the Department of Agriculture for the 5-year period from 1917 to 1922. During those years the land planted to cotton offered a possible yield of 102,760,000 bales of cotton, yet the actual harvest was but 56,158,000 bales.

Early Planting to Foil Weevil

While many factors have contributed to the yearly depreciation of the cotton crop during the growing period, the losses caused by the boll weevil hold a paramount position. This has been shown not only in actual damage to the crop but also in influencing planters to sow early maturing seed with the purpose of securing an outturn before the weevil damage is accustomed to be felt. Such procedure may result in a larger yield of cotton, but at the expense of the long staple variety.

In attempting to combat the weevil, experience has demonstrated that calcium arsenate is most efficient. The government has conducted extensive experimental work to verify this statement and has tried to educate the planters in the proper use of this poison, with the result that consumption of arsenate is increasing in the Southern states. During the past season about 10 per cent of the cotton acreage was treated with calcium arsenate. The percentage of the acreage treated in the various states is shown by the following:

	Per Cent of Acreage Treated
Alabama	7
Arkansas	14
Florida	15
Georgia	37
Louisiana	8
Mississippi	5
North Carolina	8
Oklahoma	0.5
South Carolina	37
Tennessee	10
Texas	2.5

If still further increases in consumption of arsenate are to follow next season, an adequate supply of white arsenic must be rendered available. In the early part of this year marked gains in the domestic output of white arsenic were freely predicted. For a time these estimates seemed warranted and production was on a scale which promised to satisfy all consuming needs. During the summer period there was the usual let-up in producing plants, and operations at copper smelters since then have not been such as to encourage hopes for a large yield of arsenic. Offerings from foreign countries also have diminished in the past 3 months and im-

ports which ran unusually high for the first 9 months of the year have taken a decided slump.

It is evident therefore that the meetings to be held by Southern members of the House of Representatives and by the arsenic committee are pregnant with possibilities for developing supplies of both arsenic and calcium arsenate. Undoubtedly the placing of long-time contracts would stimulate production of arsenic, although conditions outside the arsenic and arsenate markets have much to do with fixing the amount of arsenic produced at American plants.

New Jersey Chemists Hold Annual Field Day

In keeping with its usual custom, the New Jersey Chemical Society held its annual field day on Saturday, Nov. 17, at a Jersey college—this year at Stevens Institute of Technology in Hoboken. Many members turned out to see the Stevens-Swarthmore football game held on the campus during the afternoon, which Swathmore won 21-0.

Stevens Castle was the scene of dinner, following which an evening meeting was held in the Stevens auditorium. Dr. Raymond F. Bacon spoke on sulphur, mentioning several of its less-understood properties and uses. Among the points of interest he brought out that when concrete sets it is capable of absorbing as high as 15 per cent of sulphur, thus becoming much more highly resistant to the action of acids. When mixed with charcoal, fused and molded, acid-proof vessels may be made. These vessels give promise of finding considerable application in handling corrosive liquids, although development is as yet in an experimental stage. A sulphur compound bearing an organism of oxidizing properties has been developed for agricultural application in which field it is especially suited.

Following these remarks on sulphur, Prof. Harold Hibbert of Yale talked on Cellulose, pointing out its various forms of occurrence and applications in the arts and sciences. He stated that more research on the constitution of this compound has been done in the last 5 years than during any period in the past.

Czechoslovakia Encourages Nitrogen Production

The draft of a law having as its object the encouragement of the Czechoslovak nitrogen and fertilizer industries will be presented by the Minister of Agriculture at the forthcoming session of Parliament, according to the *Prager Presse*. These industries are to be assisted either by a reduction of their taxes or their complete exemption from the payment of taxes. Up to the present time Czechoslovakia has depended largely upon Germany for its supply of nitrogen. The increasing difficulty of obtaining this product from that source is one reason for desiring to develop domestic production.

German Dye Producers to Resume Ruhr Activities

An agreement was signed Nov. 10 between the Rhineland High Commission and German dye producers in the occupied areas whereby production of dyestuffs will be resumed in the Ruhr factories under the terms of the occupying forces, with a free export market for the manufacturers, according to a cablegram dated Nov. 21 received by the Chemical Division of the Bureau of Foreign and Domestic Commerce from Trade Commissioner Breithut, at Paris.

By this agreement, the message states, there will be a renewal of the delivery of dyestuffs to the Allies for reparations account. The seizures by the French and Belgians when they occupied the Ruhr are validated and the German producers accept the rules and instructions of the High Commission covering exports to free markets and to the unoccupied areas of Germany. So far as known now, these rules require an export license from the occupying authorities, and payment of an export tax to the High Commission.

Comment on the situation was withheld by official Washington until more complete information is received. It is not believed, however, that the agreement will have any effect upon dye manufacturers of the United States other than to intensify competition for sales in the Far East.

Ethylene Dichloride Promises Value as Anesthetic

Very successful tests have been made on ethylene dichloride as an anesthetic by H. C. Fuller, consulting chemist, working with Dr. O. B. Hunter, pathologist at the George Washington University Hospital, Washington, D. C., with the collaboration of Dr. C. N. Chipman, a prominent anesthetist. Previously it has been well known that ethylene itself was a good anesthetic, but it has been impractical to use this gas, because of the difficulty of transportation and manipulation as compared with liquids, such as ether and chloroform.

Ethylene dichloride is not strongly flammable and therefore has a great advantage over ether for use in operations where it is necessary to work by artificial light. The ethylene dichloride also has a great advantage as compared with chloroform in that it produces no deleterious heart depression. Moreover, the after effects are much more favorable.

Cement Association Meeting

The annual meeting of the Portland Cement Association was held at the Biltmore Hotel, New York City, Nov. 19, 20 and 21. The first day is devoted to committee reports and the last day to the formal meeting of the association. At the open meetings on Nov. 20 several interesting papers were read. Paul C. Van Zandt, formerly chief engineer of the Asano Portland Cement Co., who has recently returned from Japan, gave an interesting account of the operating technique and economics of the industry there. Another paper, by T. H. Cosford, assistant general manager of the Marquette Cement Manufacturing Co., discussed the packaging and bagging of cement.

One of the most interesting features was a talk on the British portland cement industry by A. C. Davis, one of the group of prominent officials of British companies who are visiting plants in this country.

Oliver Filter Co. Acquires Portland Filter Rights

An important deal, which should facilitate the more efficient marketing of a rotary drum filter with the combined features controlled under the patents held by the Oliver Continuous Filter Co. and the Colorado Iron Works Co., was consummated at San Francisco recently, when the Oliver company acquired the rights owned by the Denver firm in connection with the manufacture of the Portland continuous filter.

It has been realized for some time that the scope of the rotary vacuum filter was tending to develop in considerable volume in fields other than mining, for which it was primarily designed. Competition between the two companies was realized to be purposeless, and the Colorado Iron Works Co. was particularly desirous of an opportunity to expand operations in connection with the manufacture of its other specialties, particularly the Lowden drier, the Akins classifier and the Impact screen.

For the present at least the manufacture of the Oliver filter, the name of which will not be changed, will be continued at Oakland, Calif.

Chemical Engineers Plan Busy Washington Meeting

Plans for the meeting of the American Institute of Chemical Engineers in Washington, D. C., Dec. 5 to 9 are practically complete and the official program is now available. This is substantially the same as was published in *Chem. & Met.* on Oct. 29, p. 815. In addition to the papers previously noted it is announced that Hugh K. Moore will speak on "The Fundamental Principles of Multiple Effect Evaporative Separation," on Wednesday afternoon.

Saturday morning will be devoted entirely to plant visits instead of to a discussion of general papers, as was previously planned. It has been decided to have two phases of the nitrogen industry discussed on Friday evening. Walter A. Patrick will speak on "Rate of Oxidation of Nitric Oxide" and Charles O. Browne on "Synthetic Ammonia From Byproduct Hydrogen."

Washington News

Dictionary of Specifications Advisory Board Meets

A meeting was held recently of the board organized to act in an advisory capacity to the Department of Commerce in compiling material for and publishing a handbook of specifications for commodities purchased by federal, state and municipal governments and public institutions. It was stated in last month's bulletin of the Bureau of Standards that there are more than 20,000 commodities which can properly be classed as articles purchased out of taxes for which there should be specifications, whereas there are now in existence less than 5,000 specifications for such commodities.

At a meeting of the advisory board, at which there were present representatives from all but one of the organizations represented on the board, unanimous approval was voted for the proposed plan for issuing shortly in convenient form a thoroughly classified list of all known existing commodity specifications.

The board voted unanimously for the creation by the Secretary of Commerce, as chairman of the board, of three committees from its membership to render reports for the approval of the board on the subjects of (1) classification of commodity specifications; (2) form and size of the publication; and (3) scope of the proposed handbook or encyclopedia of specifications.

It was the unanimous opinion of the board that future meetings should be subject to the call of the chair.

Labor Troubles in Chilean Nitrate Fields

A report from Vice-Consul R. P. Butrick at Iquique says that business in the northern half of Chile's nitrate field was brisk during September and the revival of the nitrate industry is now being fully reflected in local trade. A general strike of port workers began on Sept. 22 (continued until the middle of October) and resulted in complete paralyzation of loading operations in the harbor of Iquique, although discharging was carried on by ships' crews without serious difficulty. From a small beginning the strike came to involve important issues. On Sept. 23, the redondilla, or turn system of employment, similar to that in effect in some coal fields in the United States, was abolished by the government. Iquique had for some time been the only port of Chile with this system of harbor work, which was apparently left in force because of the strength of the labor unions. With the abolition of the redondilla, local firms opened registers for inscribing names of workmen who will be directly employed by the shipping interests instead of supplied through the redondilla. Large numbers have registered. Government protection has been assured all who desire to work, extra police being on duty and a warship having been stationed in the harbor. It would seem that both the government and the nitrate interests are weary of the frequent strikes in this area and are adopting firmer methods.

Supreme Court Makes Ruling in Rubber Vulcanizer Case

The United States Supreme Court has refused to grant a writ of certiorari to review the suit of the Dovan Chemical Corporation against the National Aniline & Chemical Co. regarding alleged infringement of the Weiss patents for shortening the time for vulcanizing rubber compounds. The suit involved the exclusive right to use diphenyl-guanidine and hinged upon the testimony of one defence witness that others had produced this chemical by direct experiment. The lower courts decided there had been no infringement, and this decision will stand.

Change in Freight Rates on Liquid Chlorine

It is announced that new freight rates have been established for transporting liquid chlorine in tanks and cylinders. The changes apply on C. & O. stations, Kanawha City, South Buffner, Charleston, South Charleston, Elk and St. Albans, W. Va., to points in the East. New rates are 47c. to Philadelphia, 49c. to New York and 53c. to Boston.

Chemical Division Complimented on Boston Exhibit

The du Pont company has addressed the following letter to T. W. Delahanty, of the Chemical Division of the Department of Commerce:

"We wish to compliment the Chemical Division on the recent exhibit at the Textile Exposition in Boston. Your material was well arranged and was the subject of much interesting comment, not only from those active in the chemical and textile industries but from the casual visitor as well. Such exhibits tend to educate the public to the relationships of important industries. The men in charge of your booth knew their subject thoroughly and were very conscientious and considerate in answering even the most trivial question.

"Your lectures were very good and instructive to those who were fortunate enough to be in attendance at the time they were delivered.

"It gives us great satisfaction to know that the government appreciates the importance of the connection of two of America's large basic industries, chemicals and textiles, and we hope that your department will be in a position to participate in future expositions such as that at Boston."

Ladd and Madden Back Ford on Muscle Shoals

The new Congress is to have the old question again propounded, "What is to be done with Muscle Shoals?" Representative Madden of Illinois is known to have a bill ready for introduction in which the building of an auxiliary steam plant to take the place of the Gorgas plant, recently disposed of to the Alabama Power Co., is provided. It is stipulated that the new plant should not cost more than $3,500,000, the sum realized on the Gorgas sale. Some such action is required, it is believed, because Ford has stated that the Gorgas sale cancels his offer.

Senator Ladd of North Dakota has issued a statement urging the acceptance of the Ford offer. He says: "My own studies have led me to the conclusion and my investigations made during the past summer in Germany only the more strongly confirm my belief in the possibilities of the great undertaking at Muscle Shoals for the manufacture of commercial fertilizers."

Legislation Sought to Permit Import Combinations

Legislation will be presented at the forthcoming session of Congress intended to expand the Webb-Pomerene act so as to permit certain import combinations. The bill proposing such an amendment probably will specify that these combinations are to be limited to such commodities as are under monopolistic or other foreign control, which enhances the price unduly to the American consumer. Before such combinations would be authorized, the bill probably will specify that the Secretary of Commerce must submit a finding as to the prejudicial conduct of those in control.

In this connection it is pointed out that a powerful weapon would be placed in the hands of the American consumer were all purchases negotiated by a single agency of such products as rubber, nitrate of soda, sisal hemp, camphor, iodine and a long list of other products not produced within the country in quantities sufficient to influence the market.

Gas Hazard in Manholes

Explosive mixtures of gas and dangerous concentrations of carbon monoxide have been found to exist in telephone manholes in Philadelphia. The tests were made by the U. S. Bureau of Mines. Carbon monoxide was present in dangerous quantities in thirteen out of fifteen manholes chosen at random. Of eight other manholes, suspected of being gaseous, highly irrespirable atmosphere was found in seven. In two of them explosive mixtures of gases were encountered.

Equipment Men Adopt Code of Ethics

Fair and Unfair Practice in the Sale of Chemical Equipment Defined —Interests of Buyer Considered on Par With Those of Seller

THE organized manufacturers of chemical equipment and accessories have just defined in a formal document fair and unfair business practices as these affect their dealings with the chemical and chemically controlled industries. This document is now the Code of Ethics of the Chemical Equipment Association. It was recently adopted by an overwhelming majority of the active membership of the association and is regarded as having great significance with respect to all dealings involving essential equipment and accessories.

The code is the result, according to the association, of an effort to define fairness in business practice in such a way that the interests of both buyer and seller may be protected. Equipment manufacturers have long felt that certain practices have been countenanced by custom which a fair-minded examination of the facts would plainly establish as abuses against the seller. They have also been cognizant of the purchasers' right to have certain habits of trade, and protective practices, given general recognition.

With these two main considerations in mind, the association a number of months ago intrusted the formulation of a code of ethics to a committee comprising Edwin C. Alford, T. Shriver & Co., chairman; W. B. Tardy, Schutte & Koerting Co., and A. B. McKechnie, Parks-Cramer Co. This committee, collaborating with the secretary of the association, Roberts Everett, undertook a considerable investigation of current business practices the final result of which is the code now officially adopted by the organization and which follows:

Members Recognize Obligations

A. Members of this association regard themselves as being engaged in a business the fundamental importance of which to American industry imposes upon them a more than ordinary obligation toward their customers and the public, not merely as regards engineering exactitude and thoroughness, and honesty of manufacture and of service, but business conduct in its every phase. They pledge themselves, therefore, to the business principles herein formulated, both those designed primarily to safeguard the buyers of their products and services and those which, on the other hand, assure the members of the association the business and professional protection and consideration which is rightfully their due, and they accept the authority of the association to enforce these principles among its membership, within the natural limits of administration of the trade association and within the provisions of its constitution and bylaws.

B. Ethical practice shall be such in the eyes of the association that it shall constitute a violation thereof if any member:

1. Knowingly or deliberately manufactures or distributes products fundamentally inapplicable to the purposes for which they are offered for sale, or demonstrably of inefficient or unsatisfactory character.

2. Offers or pays commissions to purchasers or prospective purchasers or their employees or engages in commercial bribery to obtain new business on the continuance of patronage by direct or indirect rebating of purchase money, by granting long-term credits not in keeping with trade custom, by excessive entertaining or any other means.

3. Willfully misrepresents to buyers or prospective buyers the quality or character of commodities or services offered by that member.

4. Uses trade names or descriptive terms which simulate trade names or descriptive terms (unless generic terms or recognized scientific or engineering terms) of other articles or misrepresents the conditions of manufacture or of origin of articles offered.

5. Distributes samples of better grade than the product they are supposed to represent.

6. Participates in trade boycotts or combinations of traders to prevent buyers from obtaining goods through customary channels.

7. Sells or offers for sale rebuilt articles as new products, or sells or offers for sale articles represented as originally designed and manufactured for a use or uses other than those for which the articles actually were originally designed and manufactured.

8. Engages in "leader" selling—that is, selling one piece of goods at less than cost and recouping on others sold at the same time.

9. Makes up and disseminates false cost sheets.

10. Discriminates in prices between different purchasers or different localities upon other than legitimate costs, sales and delivery considerations.

11. Willfully misrepresents market or supply conditions either as to finished products or raw materials, in such manner as induces or is designed to induce buyers to overbuy requirements or contract for future deliveries to their plain loss or disadvantage.

12. Divulges, without authorization to any person, information obtained confidentially as to business affairs or technical methods and processes of a client or customer.

13. Refuses on technicalities of contract or for other reasons to replace gratis or to obtain such replacement from the manufacturer (if the member has acted merely as distributor or jobber) parts of equipment which have been proved conclusively to be defective in their manufacture.

14. Refuses to devote its special knowledge, skill and training to the public welfare when called upon by governmental authority or recognized civic and industrial authorities and agencies.

C. Further, ethical practice shall be such in the eyes of the association that it shall constitute a violation thereof, if any member:

1. Offers to any individual in, or section of, the buying field for such equipment, other than to any actual buyer, complete information regarding the member's equipment and the operation thereof, except in such cases where the possession of such complete information does not form an inherent and vital part of the commercial value of the equipment.

2. Provides to others than to actual buyers blueprints and other information for detailed estimating purposes, of other than approximate and general character only, in all cases where the possession of such information is of inherent importance in the making up of specifications for work.

3. Provides gratis to customers or prospective customers services other than those connected with the selling of its particular products and the erection and operation thereof, such as bearing the cost of trips by experts whose presence is desired by buyers for reasons not connected with manufacturing or erecting deficiencies in equipment sold, and any other service of like sort.

4. Permits buyers or prospective buyers to demand guarantees as to operation of equipment other than such approximate guarantees as may be given in good faith, based on best average efficient operation.

Further Violations Enumerated

D. Further, it shall be considered ethical in the eyes of the association if a member refuses to enter, or to remain in, business relationship with companies or individuals that have been or are found to:

1. Divulge confidential information, such as engineering data, prices or any other confidential facts, given to them by any member in connection with a sale or a projected sale or in any other circumstances.

2. Repeatedly, or ostensibly for other purposes, request quotations, drawings, etc., for comparison only.

3. Repeatedly, or ostensibly for other purposes, request quotations to be used for inventory purposes only.

4. Request, ostensibly with buying interest, information of equipment actually intended to be used in building the same equipment.

5. Make improper use of drawings or prints supplied to them by any member.

E. Further, ethical practice shall be such in the eyes of the association that it shall constitute a violation thereof if any member:

1. Speaks, or its employees or any one of its employees speak, untruthfully of a competitor or a competitor's personnel, or makes, or its employees

or anyone of its employees make, untruthful statements, either written or oral, respecting a competitor's products, selling prices, business, financial or personal standing.

2. Offers or authorizes an employee or representative to offer quotations on work already contracted for or completed by another manufacturer.

3. Seeks or authorizes an employee or representative to seek the cancellation of orders previosly placed with a competitor.

4. Attempts to tamper with or misadjust goods sold by a competitor for the purpose of discrediting him with a customer.

5. Sells or offers to sell below cost or at less than fair profit for the sake of embarrassing a competitor in obtaining business.

F. It is within the spirit of the ethics of the association that this formulation of them shall in every instance be liberally construed as applying to every possible product and service coming within the field of chemical equipment, within the interest of its membership; to every class of business represented among that membership, whether manufacturing, designing, erecting, distributing, consulting or what not; and to every business and professional relationship, as of maker to user, seller to buyer, engineer to client, or competitor to competitor, that normally arises or at any time may arise, involving a member of the association as a party and the field of chemical equipment as the association has or may define it, as its base.

German Chemical Industry in Hopeless Condition

Germany is suffering from economic anemia, in the opinion of C. C. Concannon, chief of the Chemical Division of the Department of Commerce, who has just returned from a trip to Europe. While Mr. Concannon admits that his diagnosis necessarily was a superficial one, he is convinced that the anemia from which Germany is suffering is of the pernicious type. In fact, he is impressed, more than by any other observation he was able to make, with the hopelessness of the German situation. He talked with a large number of well-informed persons, but no one of them has any practical solution to offer. He admits that Germany could be restored were it possible to repatriate German funds and German resources now held outside of the country, but that is manifestly impossible. It could be done only by making it profitable for the individual holders of these assets to utilize them more profitably in Germany than anywhere else. If reparations are to be paid in any amount that would be acceptable to the French, it very apparently will be necessary to maintain tax levies on higher levels than in other countries where these funds can be employed.

Mr. Concannon returns to this country more convinced than ever that the United States in the future will be the predominant manufacturer of coal-tar products. He is convinced that the chemical industry in this country is on a sounder basis and has a brighter future than that of any other country in the world.

News in Brief

Increased use of carbonate of copper, in connection with the control of wheat smut diseases, is expected by the Department of Agriculture. The dusting of grain with this chemical has proved to be highly efficient. Despite the fact that it has been used only since 1920 in the treatment of smut, fully 500,000 lb. of the material now is being used for that purpose.

Several weeks must elapse in all probability before it will be possible for the State Department to call the proposed conference on oil pollution. The assembling of necessary data and reports is not yet complete. It is believed, however, that the situation has resolved itself largely into a matter of prescribing the mechanical devices necessary to make proper oil disposal comparatively easy.

An explosion in an army ammunition factory near Santiago, Chile, on Nov. 19 killed several and wounded more than fifty workmen. The cause of the explosion in this plant, which was equipped with American machinery and which began ammunition manufacture about 2 years ago, is not known.

If the average person uses seven matches a day, as is the case according to expert opinion, then last year approximately 4,675,650,000,000 matches were consumed. The National City Bank of New York, which has been conducting an investigation along these lines, estimates that the world paid approximately $200,000,000 for these matches.

English and American syndicates are arranging to treat the concentrates of arsenic to be obtained from the various gold mines in the vicinity of Dartmouth and Halifax, Nova Scotia, and have an option on a property in Dartmouth with a view of establishing a large smelting plant in the near future. This is stated by Romilly Smith, general manager of the Clark Gold Mines Corporation.

The Dominion Alloy Steel Corporation, Ltd., has appointed R. D. Nye to be in charge of the preliminary engineering work necessary to the construction of its $5,000,000 alloy steel plant at Sarnia, Ont.

A new record in coal analyses has been established at the Pittsburgh station of the Bureau of Mines. During October 1,500 samples were analyzed for various government agencies. It is regarded as an indication of the trend toward the purchase of coal on the basis of quality.

The American Association for the Advancement of Science plans to meet in Cincinnati the last week in December. The local A.C.S. section is planning to co-operate with the chemistry division of the A.A.A.S. in holding an intersectional meeting on Friday and Saturday, Dec. 28 and 29. While all A.C.S. sections are invited to co-operate in this intersectional meeting, all Ohio sections have been especially urged to do so.

Los Angeles Gains Steel Mill

The Pacific Coast Steel Corporation, San Francisco, Calif., organized several months ago under Delaware laws to consolidate different steel interests on the Pacific Coast, has exercised the option held on a tract of 200 acres of land at Long Beach, near Los Angeles, heretofore held by the Los Angeles Dock & Terminal Co., and has purchased the land for a consideration stated to be $2,000,000. The site will be used for the construction of a new blast furnace and steel mill estimated to cost close to $6,000,000. The plant will consist of a 600-ton furnace, with bar and other rolling mills, power plant and auxiliary structures.

Sweden Reports Potash Beds

In reply to inquiries made by Sveriges Geologiska Undersoekning it has been stated that large and conveniently situated potash deposits have been found in several places in Sweden. One very extensive vein stretches from Oestergoetland up to near Stockholm. At Aammeberg and to the north of Braaviken large deposits also exist. According to the papers, the best situated deposits will be exploited for the production of fertilizers and cement.

Kraus Discusses Elements

One of the most successful meetings that has been held at the Chemists' Club this season was that of the New York Section of the American Electrochemical Society on Nov. 16. Dr. Charles A. Kraus spoke on "The Properties of the Elements in the Electronegative Condition." There was an unusually large attendance and evidence of exceptional interest in the subject. In the absence of Dr. Paul Merica, chairman of the section, the meeting was in charge of Secretary Paul Manning.

Meat Research Fellowship Announced by Lowenstein

A gift of $2,500 a year for 3 years for the purpose of creating the first research fellowship in connection with the newly organized Institute of Meat Packing at the University of Chicago has been made by Arthur Lowenstein, vice-president of Wilson & Co.

This research will be carried on under Prof. E. O. Jordan, chairman of the department of bacteriology of the university. The packing industry has devoted considerable activity to applied science and prosecution of fundamental research in the past. This work has been done in the individual plants and laboratories.

Trade Depression Reduces Demand for Chemicals in China

Imports Show Material Decline—United States Not Prominent Among Supplying Countries—Prices Lower Than Last Year

THE slow position of the chemical market in China is indicated in a report from Consul Leroy Webber, in which he gives numerous details of the trade in the Hongkong district. His report states that the market for chemicals at Hongkong since the beginning of 1923 has been dull and uninteresting. No special interest has been shown in any line, and no large transactions have taken place. Prices have declined generally, and in many cases very considerably. Dealers are merely buying immediate requirements, very little forward business being done. This state of affairs is due to the general trade depression and the unsettled conditions prevailing everywhere in China.

Chlorate of Potash—Imports of chlorate of potash during 1923 amounted to more than $100,000, practically all from Germany. It is used in connection with the manufacture of matches and firecrackers. Importations are made in kegs of 112 lb. net. Prices have declined considerably, being about $12 per keg, compared with about $20 last year. Demand is fair and stock on hand sufficient to meet it.

Chloride of Lime—Importation of chloride of lime is small and chiefly from Japan. It comes packed 100 lb. to a case. Demand and price are steady, the price being about $9 per case. Its uses are for bleaching and disinfecting.

Red Phosphorus—The amount of red phosphorus received is below normal. Approximately $7,500 worth was imported during the first 6 months of 1923. Germany supplied fully 85 per cent, the remainder coming from France and Japan. It is generally used for making matches and firecrackers. Shipments arrive packed in tins containing 5 lb. net. The price is about $2 per pound. Demand is good, with a fair amount of stock on hand.

Sulphate of Ammonia—Stocks on hand are plentiful, amounting to more than 4,000 tons, with little prospect of any large sales this season on account of floods and fighting in the interior. Prices have dropped from last year's quotations of $7.50 to $8 to about $4.50 per picul (1 picul = 133⅓ lb.) at present.

Imports of sulphate of ammonia for the 6 months of 1923 amounted to approximately $1,300,000, an increase over previous years. Most of the supplies are now obtained from the United States and Great Britain, on account of Germany not being able to export at present. Shipments to this market are made in double gunny bags of about 200 lb.

Saccharine—Imports have fallen off, owing to German firms having flooded the market during the early part of 1923. The market is now considerably overstocked, and prices have dropped from $3 per pound last year to 85 cents now. Saccharine is used as a sweetening agent in various food products and beverages. Sales are slow, with but a small demand. For the Kongkong trade it is generally packed in 1-lb. tin or bottle, 100 lb. to a case.

Quinine—The yearly consumption of quinine reaches about $25,000. It is imported chiefly from Java, and the remainder comes from England. It is packed in 100-oz. tins. The demand is small with but few buyers. Present stocks are low. The current price is 60 to 70 cents per ounce for spot goods.

Caustic Soda—Imports for the current year were almost 50 per cent below those of the previous year, and for the first 6 months of 1923 amount to approximately $44,000. England supplies most of the caustic soda used in Hongkong. Imports from the United States amount to only about 10 per cent of the total. It is generally used for soap and paper making, and comes packed in iron drums of 5 piculs each. The present price is about $5.50 per picul.

Soda Ash—Imports of this commodity for the first 6 months of 1923 will approximate $50,000, a decrease of about 100 per cent as compared with the figure for the previous year. Fully 90 per cent is from Great Britain and the remainder from Japan. It is used for making washing soda, etc. The demand is small, with ample stocks. The present price is about $2.85 per picul.

Soda Bicarbonate—During the first 6 months of 1923 only $200 worth was imported. Most of this amount came from Japan, and the balance from England and the United States. It is used in mineral-water manufacturing, and is packed for this market in bags of 2 piculs or 2 hundredweight. The present price is about $4.15 per picul.

Nitric Acid—Ample nitric acid stocks were left over from 1922. Imports for the first 6 months of 1923 will not exceed $3,000. Practically all of the nitric acid used locally is of Japanese production. Shipments are made to this market in cases of 140 lb. net (2 jars). Price is about $5.50 per case.

Sulphuric Acid—The demand for sulphuric acid has been very small. Stocks are ample. Imports during the first 6 months of 1923 will amount to approximately $15,000, a decrease of about 40 per cent as compared with 1922. Japan furnished 95 per cent. The balance came from north China and the United States. Shipments arrive in this market packed in cases of 200 lb. net (2 jars). The present price is about $6.75 gold per case.

Hydrochloric Acid—There is only a small demand for hydrochloric acid, and there is a fair supply on hand. Annual imports average about $25,000, all of which come from Japan. It is packed in cases of 120 lb. net (two jars per case). The present price is about $6 per case.

Italian Monopoly Unsuccessful in Marketing Citrate of Lime

According to advices recently received from Commercial Attaché H. G. MacLean, at Rome, the operations of the Camera Agrumaria of Messina, which has had the monopoly of the sale of citrate of lime, have been decidedly unsuccessful. This semi-official organization has been taking over the entire production, making payment to the producers at a price fixed annually by the Ministry of Commerce, and has succeeded only in accumulating large stocks of citrate and debts, which on May 31 amounted to 86,500,000 lire. There are two principal reasons for this unsatisfactory situation: (1) The only interest of the producers was that of bringing pressure to bear on the government to fix the price at which the citrate is taken over at as high a level as possible. (2) In view of the fact that the selling price has also been fixed by the government, there has been no flexibility and it has been impossible to adjust prices to correspond with changes in the condition of the market in such a way as to stimulate purchases.

The producer has been making money and it has made no difference to him whether or not stocks were accumulated in the warehouses of the Camera, while the latter has been to a large extent powerless to take any action that would relieve its difficult position.

The Minister of Finance authorized the banks of issue to continue the financing of the Camera Agrumaria during the current year, which ends on Nov. 30, only on condition that from Dec. 1, 1923, the advances to the producers by the Chamber should not exceed the proceeds of sales and that at the same time provision should be made for the gradual extinction of its debts to the banks. The Cabinet has just approved a decree which makes this plan effective, whereby sales of citrate will no longer be made by the Camera for its own account, but for account of the producers, who will consequently be directly affected by fluctuations in the market. Instead of advancing the full amount of the price fixed at the time the citrate is delivered, this having been made possible by the financial support received from the banks, payment will be made of only three-quarters of the minimum price fixed at the beginning of each year by the government. Further payments will depend on the amount of sales and upon the price received.

General Expansion Taking Place in Paper Industry

Mills Are Improving Present Equipment and Increasing Capacity in Most Lines of Production

A REPRESENTATIVE number of paper mill projects, involving millions of dollars in buildings and equipment, are now in progress in different parts of the country and Canada, covering complete new plant units, as well as additions to present mills. A considerable portion of the expansion will see completion within the next 3 to 4 months, with immediate production to follow.

The Mead Fibre Co., Kingsport, Tenn., has work under way on an extension for the manufacture of magazine and book papers, to cost in excess of $200,000, and purposes to have the unit ready for service at an early date.

The Brown Paper Mill Co., Monroe, La., a new organization, is pushing construction on its large local plant, to be devoted exclusively to the production of kraft papers. It is estimated to cost about $1,000,000, and will be ready for service early in the spring of the coming year.

The Daily News Paper Corporation, a subsidiary of the Ontario Paper Co., Thorold, Ont., has laid the cornerstone for its new mill on Little Island, North Tonawanda, N. Y., to cost close to $400,000, and will have the unit ready for operation the middle of next year.

The Hummel-Ross Fibre Corporation, Hopewell, Va., has construction nearing completion on a new local paper and pulp mill, and will place the plant in active service in the next 60 to 90 days.

The Saint Regis Pulp & Paper Co., Quebec, Que., has tentative plans under consideration for the construction of its proposed pulp and paper mill on site recently acquired at Cap Rouge, near Quebec, to cost close to $3,500,000, designed to give employment to more than 600 men.

The Backus-Brooks Co., Kenora, Ont., has work nearing completion on the first unit of a new mill, to be devoted to the production of newsprint, and purposes to place a portion of the works in service in about 30 days; the plant will have a rated capacity of 100 tons per day, and it is intended to add other units, each with similar output, until a maximum production of 500 tons daily is attained.

The Central Paper Co., Muskegon, Mich., is finishing a new mill addition and will place the unit on the active list at an early date.

The St. Maurice Lumber Co., a subsidiary of the International Paper Co., New York, has construction in progress on a new pulp and paper mill at Three Rivers, Que., designed as one of the most modern and fully equipped mills in any part of the world. It will cost more than $5,000,000.

Caustic Soda and Bleaching Powder Plant in Mexico

According to a report from J. Q. Wood, consul at Vera Cruz, a new chemical industry is being established at Orizaba in the State of Vera Cruz. It is located in the midst of the textile industries, which will take practically the entire output of the new plant. Caustic soda, muriatic acid and bleaching powder are to be manufactured. It is reported that the new industry is the only one of the kind in Mexico.

The plant will use 150 tons of decomposed common salt. It is stated that the best salt available would be at New Orleans but for the present high duties. A satisfactory salt therefore has been found at Salina Cruz, and Yucatan also produces a salt that can be utilized. The output of chemicals per mouth will be 2½ tons of caustic soda, 4 tons of muriatic acid, 3 tons of bleaching powder and considerable quantities of chlorine products.

The hydro-electric equipment of 1,200 hp. has already been intalled, having been purchased in the United States, as well as all other orders for machinery. It is stated that the amount of the purchases from American manufacturers reaches $100,000.

The company is organized under the Mexican laws and capitalized at 300,000 pesos (1 peso = $0.482), all of which has been paid in. American, Spanish and Mexican capital controls the enterprise. The manager is a Spanish subject who was educated and trained as a specialist in the technical schools of Canada and the United States. The company has entered into a lease for water rights for a period of 10 years, with an option to purchase at the expiration of the lease.

The products to be manufactured by the new industry previously have been furnished by England and the United States, particularly by the former. This market will doubtless lose the large part of this trade in consequence of the contemplated local production. Exports of caustic soda from the United States to Mexico amounted to $557,120 in 1920 and to $287,216 in 1921. The plant, it is reported, will not be in operation for 6 months.

German Bauxite Mining Ceases

It is reported by Consul F. W. Dumont, at Frankfort-on-Main, that the bauxite mining industry in Germany is at a standstill. Before the war Germany obtained most of its bauxite from France, importing approximately 38,000 metric tons in 1913. During the war deposits in Upper Hessen were developed. The monthly output was about 1,200 tons having an aluminum content a little less than that of the French.

Financial

E. I. du Pont de Nemours & Co. have declared a quarterly dividend of $2 on the common stock. This is an increase from previous rate of $1.50 quarterly. The company also has declared regular quarterly dividend of 1½ per cent on debenture stock.

William M. Wood, president of the American Woolen Co., announced last week that a syndicate had underwritten a 10-year 6½ per cent note issue for $5,500,000 for financing the Webster Mills.

The Beech-Nut Packing Co. has declared an extra dividend of 60 cents on the common stock. Stockholders at a special meeting ratified the action of the directors in declaring a 50 per cent stock dividend on the common, payable to stock of record Dec. 1.

The Texas Gulf Sulphur Corp. has declared an extra dividend of 50 cents and a regular quarterly dividend of $1.50. The statement of the corporation as of Oct. 31 showed current assets of $5,745,000, of which $3,907,000 was cash in banks, compared with current assets Dec. 31, 1922, of $4,094,000, of which $2,082,000 was cash. Current liabilities were $309,000, compared with $359,000 Dec. 31, 1922.

Application was made last Wednesday to list the capital stock of the Gold Dust Corporation on the New York Stock Exchange. The authorized capital of the company includes $5,000,000 of 6 per cent non-cumulative non-voting preferred and 325,000 shares of no par common stock. This stock is being exchanged for that of the American Cotton Oil Company.

The National Lead Co. has declared a quarterly dividend of 2 per cent on its common stock.

Glass Trade Appeals From Federal Court Decision

The National Association of Window Glass Manufacturers and the National Window Glass Workers through their representatives appeared in the Supreme Court last week in an appeal to set aside the decision of the Federal District Court for Northern Ohio, holding them guilty of having, in violation of the Sherman anti-trust law, entered into an agreement relating to wages and working agreements which had the effect of restraining interstate commerce.

John W. Davis, counsel for the manufacturers, stated that the courts were asked to hold an agreement between employers and employees on wages and working conditions a violation of law.

Solicitor General Beck insisted that the agreement complained of had been made for the purpose of enhancing prices and that it imposed upon the public the additional cost of maintaining an industry which worked only a portion of each year.

Market Conditions

Contract Withdrawals Up to Normal But New Business Moderate

Most Consumers of Chemicals Covered for Nearby Needs—Recent Price Declines Encourage Conservative Buying

TRADING in chemicals and allied products was along moderate lines during the week. Consuming trades appear to have sufficient supplies of raw materials for current needs and are not showing much interest in forward positions.

The easy tendency to prices in recent weeks has brought about a better buying movement in some selections and slowed up demand for other commodities. Price declines in prussiate of soda resulted in an improved call for stocks and sales show a decided gain for the week. Bleaching powder, however, has not been in active demand and lower prices have not influenced buyers to enter the market.

The weighted index number for the period was higher than for the preceding week with some of the important basic commodities in the allied list selling at higher levels and thus affecting the weighted valuation. In the strictly chemical list, prices were fairly steady and in many cases current values are said to be close to producing costs with further declines improbable unless drastic changes should occur in the position of raw materials.

One of the features to trading for a long time has been the keenness of competition among sellers. Imported chemicals have figured in this competition but commodities free from outside influences also have been under selling pressure. In the case of bleaching powder this is undoubtedly due to predominance of production over consumption. Possibly the same explanation is true, to a greater or less extent, of other chemicals. Of interest during the week was a report which stated that members of the House of Representatives from Southern states would meet this week to discuss the situation in the market for arsenic and calcium arsenate. They will attempt to work out plans to insure a large home production of arsenic so that adequate stocks of arsenate may be available for the next cotton crop.

Among the important price changes of the week was an advance of 4c. per gal. in all grades of denatured alcohol. Higher producing costs and better consuming demand are given as reasons for the rise. Wood alcohol was unchanged in price.

A very strong market was reported for tin with good buying on the part of consumers. This has given a firm tone to the tin salts and higher prices are expected to follow.

Ethyl Acetate Higher — All Grades Alcohol Up 4c. per gal. —Arsenic Easier—Prussiate of Soda Steadies—Bleaching Powder Unchanged—Nitrite of Soda in Limited Supply—Tin Oxide Firm.

Acids

Acetic Acid—Details on exports for the month of September show that more than 75 per cent of the outward shipments were for Cuba and Mexico. Totals were 13,130 lb. valued at $1,780 for Cuba, 8,817 lb. valued at $1,151 for Mexico, 3,906 lb. valued at $560 and scattered shipments to 10 other countries, all the latter amounts being less than 1,000 lb. Total exports for that month were 29,296 lb. valued at $4,065.

Export buying remains quiet but a fair call is coming from domestic consumers. No price changes have been noted and quotations remain at $3.38@$3.63 per 100 lb. for 28 per cent; $6.78@$7.13 per 100 lb. for 56 per cent; $9.58@$9.83 per 100 lb. for 80 per cent; $12@$12.78 per 100 lb. for glacial.

Citric Acid—Domestic grades continue to hold a premium over imported but there is no life to trading. Quotations are 49@50c. per lb. for domestic and imported is generally held at 47½c. to 48c. per lb. but is easy in tone.

Formic Acid—The undertone has been firm and foreign markets are reported to be higher. This has the effect of steadying values in the local market and holders of spot goods are asking 12½c. per lb. and upward. Imports in September were 52,932 lb. valued at $4,311 and for the 9 months ended September 1,001,747 lb. valued at $72,599.

Oxalic Acid—Imports in September were 157,394 lb. valued at $15,826. For the 9 months ended September imports were 2,071,785 lb. valued at $166,035. At present imported acid is underselling the domestic as the former is freely offered at 11¾c. per lb. and domestic is held at 12½c. per lb. at works.

Tartaric Acid — Consuming demand has fallen off and a very quiet market is reported. Domestic producers continue to quote 32½c. per lb. but this price is largely nominal in view of the lower prices asked for imported. The latter is offered at 28½c. per lb. and on firm bids might be secured under that figure. Imports in September were 189,304 lb. valued at $45,770 and for the first 9 months of the year 1,512,644 lb. valued at $376,079.

Sulphuric Acid—A good call is reported from various industries and stocks accumulated in the summer have been materially reduced. Shipping instructions against old orders are numerous and new business is of seasonal proportions. No changes have been noted in raw materials and open quotations for acid also are at previously quoted levels with 60 deg. offered at $9@$10 per ton and 66 deg. at $15@$16 per ton. Oleum is moving freely with quotations at $19@$20 per ton. Imports of sulphuric acid for the 9 months ended September were 19,304,973 lb. valued at $162,095 but of this only 464,920 lb. valued at $3,524 came in during September.

Potashes

Bichromate of Potash—Exports in September were 170,156 lb. valued at $18,428 as against 157,743 lb. valued at $16,317 in September, 1922. For the 9 months ended September exports were 2,589,964 lb. valued at $236,525 as compared with 3,965,128 lb. valued at $390,871 in the corresponding period last year. The market has undergone no change during the week and prices are holding at 9½@9¾c. per lb., according to seller and quantity.

Chlorate of Potash—Domestic production is still at a standstill but some stocks are held at works and are offered at 8½c. per lb. f.o.b. producing points. Imported has met with a fair demand and is reported steady with 7½c. per lb. as the inside asking price of holders.

Caustic Potash—Imports in September were 683,755 lb. valued at $44,186 and for the 9 months ended September imports were 7,405,407 lb. valued at $486,799. Recent trading has not been active and spot offerings have been available at 7c. per lb. Shipments were offered last week at 6¾c. per lb. but forward positions are not receiving much attention.

Permanganate of Potash—Fair call is reported for domestic with producers offering at 17c. per lb. and upward at works. Imported material in the spot market was to be had at 17c. per lb. but trading was restricted and this material is not moving in a large way at present.

Prussiate of Potash—There have been sales of yellow prussiate of potash on

spot at 25c. per lb. but 25½c. per lb. is asked by most holders. The lower price levels, reached in recent weeks, have not opened up trading to any extent and a wide differential still exists between the soda and potash compounds. Shipments from abroad are offered at 22½c. per lb. Red prussiate is dull with quotations at 55@57c. per lb.

Sodas

Soda Ash—Canada continues to offer the best field for export as is shown by official figures for September when of 2,882,502 lb. exported 1,514,535 lb. went to Canadian provinces. Mexico and Cuba followed with 536,179 lb. and 459,244 lb. respectively. A very satisfactory business is passing with home consumers both in the way of contract deliveries and new orders. Contract prices are well maintained with 58 per cent in carlots at works at $1.25 per 100 lb. in bulk; $1.38 per 100 lb. in bags; and $1.63 per 100 lb. in bbl. Dense ash on contract in carlots at works is offered at $1.35 per 100 lb. in bulk; $1.45 per 100 lb. in bags; and $1.69 per 100 lb. in bbl. Dealers offer light ash in 5-bag lots at $2.04 per 100 lb. delivered in the local district and at $2.29 per 100 lb. in bbl.

Bichromate of Soda—While no heavy contracting was reported last week, a good number of consumers have taken on distant deliveries since early fall and a good call is reported for such deliveries. The spot market is confined mainly to moderate sized lots in which first hands are more prominent than dealers. Irregularity in price is still noted and open quotations for prompt material range from 7¼c. per lb. to 7½c. per lb., according to seller. These quotations refer to carlots, f.o.b. works. Some demand for export is heard but is not large enough to be a market factor.

Caustic Soda—Exports of 8,397,968 lb. in September included 1,553,365 lb. to Canada, 1,431,395 lb. to Germany, 1,202,600 lb. to Argentina, 741,260 lb. to Mexico, and 704,122 lb. to Cuba. The remainder went to various countries, none of which received as much as 400,000 lb. Export buying has been irregular recently but some good sized lots were sold. The quotation for standard brands for export is $3.10c. per lb., f.a.s. New York. Large consumers in the domestic trade are mainly covered by contracts and withdrawals are being made regularly. Quotations are on a basis of 3.10c. per lb. for standard drums, in carlots at works. The jobbing trade has improved in recent weeks but prices, while maintained in most quarters, have been shaded in some instances and this has been a disturbing factor in the past week or two.

Nitrate of Soda—Imports in September amounted to 51,543 tons valued at $2,426,684 as compared with 52,081 tons valued at $2,790,765 in September last year. For the 9 months ended September imports were 713,986 tons valued at $34,023,590 this year and 323,407 tons valued at $15,644,973 last year.

"Chem. & Met." Weighted Index of Chemical Prices

Base = 100 for 1913-14

This week	166.16
Last week	164.60
Nov., 1922	158.09
Nov., 1921	147.00
Nov., 1920	240.00
Nov., 1919	239.00
Nov., 1918	279.00

Higher prices for alcohol, crude cottonseed oil, and linseed oil, were reflected in the weighted index number, which advanced 156 points.

Buying in spot material has been quiet and prices have been easy with $2.42½ per 100 lb. representing the price. No change has been announced in prices for forward positions but the tone has been easier. Some reports are current that values will work toward lower levels but they have been denied and there is no definite trend at present.

Prussiate of Soda—More interest was shown in this product last week and some good sized quantities changed hands. Evidently consumers have taken the view that present price levels were attractive and some industries, which had not been prominent in the prussiate market, were taking on supplies. There was a steadier tone to prices and spot goods were held at 11½c. per lb. Shipments also were steady with 11c. per lb. the lowest price heard.

Miscellaneous Chemicals

Acetate of Lime—Official figures show that exports of 222,772 lb. in September were all destined for Belgium. Routine deliveries are going forward to domestic industries and the market is holding a steady position, although the total movement from works since Aug. 1 has been less than in the corresponding period last year. The quotation price holds at $4 per 100 lb.

Arsenic—It was announced last week that a meeting would be held in December of producers, consumers and distributors of arsenic and of representatives of government departments. The situation will be discussed with a view of bringing production up as closely as possible to maximum. The market is not active at present but prospects are not regarded as favoring an ample supply for coming requirements. Spot arsenic is practically neglected and is nominally quoted at 13½@14c. per lb. Sales of imported were made at 13½c. per lb. for shipment and further offerings were available at that price both from Europe and from Japan.

Bleaching Powder—The main feature in this market is the fact that production is considerably larger than consumption. Under the circumstances selling pressure is bound to be a factor as long as producers are striving to place orders on their books and thus insure an outlet for at least a part of their production. Nominally deliveries through December and contracts over all of next year are on the same price level as $1.25 per 100 lb. is quoted for carlots at works, in each case. However, the nearby positions actually are weaker than long time contracts because the quoted is less strictly adhered to where prompt shipment is concerned and some producers are not eager to book contracts at the $1.25 per 100 lb. figure. Trading is not active despite the sharp reductions which have been made and many buyers are not committing themselves far ahead although admitting that the current price is attractive. Liquid chlorine is offered on contract at 3½c. per lb., in tanks, at works.

Ethyl Acetate—Because of the higher cost of raw materials first hands advanced prices for ethyl acetate to the extent of 5c. per gal. Demand has been good. Revised prices follow: 85 per cent, 95c. per gal., in tanks, 97c. per gal., drums, carload lots, and $1 per gal., drums, less than carload lots; 99 per cent, $1.10 per gal., in tanks, $1.12 per gal., in drums, carload lots, and $1.15 per gal., in drums, less than carload lots.

Calcium Chloride—Producers report steady buying by the cement industry. Other lines quiet, but undertone steady, especially on domestic material. First hands quote $21 per ton on the fused, f.o.b. works, and $27 per ton on the granular, f.o.b. works.

Copper Sulphate — Unsettlement in the metal brought out offerings by domestic producers at 4.90c. per lb., which compares with 5c. per lb. a week ago. Imported material was offered for shipment at 4⅛c. per lb., c.i.f. New York. Trading was inactive.

Formaldehyde—First hands reported the market as unchanged at 11c. per lb. Trading has been along routine lines and the undertone in some quarters appeared easy.

Sal Ammoniac—Scattered lots of imported sold on spot at 6¼c. per lb. and offerings were reported at this figure up to the close of the week. On shipment goods importers did not care to shade 6¼c. per lb.

Alcohol

The feature in the market was the advance of 4c. per gal. in pure and denatured alcohol. Reduction in stocks together with higher production costs were given as the reason for the uplift in prices. Business in denatured has been on the increase for some time now and the market has worked into a more favorable position. Leading producers now quote: Formula No. 1, special, 45½c. per gal., carload lots, drums extra; formula No. 1, completely denatured, 46½c. per gal., carload lots, drums extra; formula No. 5, completely denatured, 44½c. per gal., carload lots, drums extra. For denatured in cooperage add 6c. to above prices. Ethyl spirits, U.S.P., in bbl., closed at $4.78 per gal. There was no change in prices for methanol. First hands quote 93c. per gal., in bbl., carload lots, on the 95 per cent. Pure methanol, tank cars, held at 90c. per gal.

Coal-Tar Products

Export Trade in Benzene Shows Gain—Domestic Business Slow—Competition Unsettles Spot Prices

PRODUCERS take the stand that prices for light oils have reached the point where further drastic reductions seem improbable. But competition for business is keen and an occasional lot of benzene is traded in at slight concessions from the basis openly quoted. U.S.P. phenol was offered on spot at 25c. per lb., with the undertone barely steady in view of the hand-to-mouth policy of buying. Salicylates came in for a better call, and this resulted in steadier prices, notwithstanding the unsettled position of phenol. Demand for intermediates, taken as a whole, was fair.

Foreign demand for benzene shows up better than a year ago. According to official information the exports in September amounted to 3,756,916 lb., valued at $117,520, which compares with 3,511,074 lb., valued at $116,986, for September a year ago. The exports of benzene for the 9 months ended Sept. 30 reached the total of 89,694,795 lb., valued at $2,923,994, against 57,769,833 lb., valued at $2,110,631 for the corresponding period a year ago.

Intermediates, other than phenol, aniline oil and naphthalene, were exported during the 9-months period to the extent of 973,958 lb., comparing with 386,728 lb. for the same period a year ago. The export movement of coal-tar colors, dyes and stains for the 9 months reached the total of 13,728,109 lb., as against 5,003,011 lb. a year ago.

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Aniline Oil and Salt—The exports for the 9 months ended with September amounted to $413,237 lb., valued at $77,789, which compares with 317,457 lb., valued at $60,986, for the corresponding period a year ago. The market underwent little if any change in the past week, leading producers quoting 16c. per lb. on the oil and 23c. per lb. on the salt, prompt shipment from works.

Benzaldehyde — Makers report a steady market. The technical is maintained at 75c. per lb., with the U.S.P. at $1.50 and the free from chlorine at $1.60 per lb.

Benzene—Open quotations held at 21c. per gal., tank cars, works, on the 90 per cent, and at 23c. per gal., tank cars, works, on the pure. With no change in the motor fuel situation, the market remains in an unsatisfactory position. The undertone at the close was barely steady and it was reported that scattered lots sold through outside channels at moderate concessions. However, producers are not disposed to force business at current levels.

Beta-Naphthol—Most traders are holding this material at the recently advanced basis of 25c. per lb., carload lots, prompt and nearby shipment from works.

Creosote—Advices from Manchester, England, report a higher market for creosote. Increased export demand was given as the reason for the strength and it was considered doubtful whether round lots could have been secured at less than 8¾d. per gal., loose, works. Several makers were asking 9d. per gal.

Cresylic Acid—Offerings from outside quarters have been larger and this tends to unsettle the market to an even greater extent, especially on the lower grades. Domestic producers appear to be in a better position to offer supplies and on contract it was possible to secure material at less than 70c. Spot quotations range all the way from 70@80c. per gal., according to grade, seller, etc.

Naphthalene—The market underwent little change in the past week. Intermediate makers appear to be well covered, while other lines have been taking usual quantities for future delivery. Chips were quoted nominally at 5@5¼c. per lb., with flake at 6@6¼c. and ball at 6¾@7c., according to position and seller. Crude held about steady in the different foreign markets. Importers say that 76 per cent material is holding at 2¼@2½c. per lb., c.i.f. New York.

Ortho-Toluidine—Prices were irregular on increased offerings and it was possible to secure material from first hands at 14c. per lb. Demand has been inactive, the recent uplift restricting business.

Paranitraniline — Demand was fair and the market held around 73c. per lb., prompt shipment from works.

Phenol—Producers took on spot business at 25c. per lb., in drums. The market was irregular and on nearby material it was intimated that slightly lower prices than those named on spot obtained. The demand was described as routine only, larger consumers restricting business to nearby wants.

Pyridine — Sellers appeared a little more anxious to offer pyridine, especially for shipment, and with demand no longer so urgent prices at the close were unsettled. Spot material settled around $5.25 per gal., with intimation that this could be shaded on a bid. On futures $4.25 could have been done.

Salicylates—Domestic as well as export demand increased, but producers announced no changes in prices. The undertone was regarded as firm.

Solvent Naphtha—Offerings were not heavy and steady prices obtained in nearly all quarters. Leading producers quote 23c. per gal., in tank cars, on the water-white, and 20c. per gal., in tank cars, on the crude, f.o.b. works.

Trade Notes

A plant for the manufacture of glauber salts, sodium sulphate and saltcake is being erected at Dunkirk, Canada. Sodium sulphate deposits in southern Saskatchewan will be drawn upon to furnish the necessary raw material.

Henry S. Chatfield, vice-president and treasurer of the Kasebier-Chatfield Shellac Co., has been appointed to represent the National Paint, Oil & Varnish Association on the Alcohol Trades Advisory Committee.

The Nairn Linoleum Co. will build an addition to its plant at Kearny, N. J., at an estimated cost of $110,000. The new building will be used for printing and drying.

Samuel H. Gillespie, of L. C. Gillespie & Son, left last week for the Pacific Coast, whence he will sail for the Orient.

The production of the Alsatian potash mines during the first 8 months of 1923 amounted to 613,976 metric tons, compared with 501,948 metric tons during the corresponding period of last year. This year's output represents 154,399 tons of pure potash, against 123,301 tons the previous year.

Installation of machinery is now under way at the new plant of the Chesebrough Manufacturing Co. at Stowe Township, Pa.

The Standard Wholesale Phosphate Co., 1214 Continental Bldg., Baltimore, Md., has arranged for a change of name to the Standard Wholesale Phosphate & Acid Works, Inc., at the same time increasing its capital to $3,000,000, for proposed expansion.

John F. Kelley, who has been in charge of the fine chemicals section of the Chemical Division of the Department of Commerce, has resigned to become assistant to the editor of *Nation's Business*, the publication of the Chamber of Commerce of the United States.

Walter S. Dickson & Co. of 90 West St., New York, are acting as manufacturers' representative for pumps, valves, combustion control, and a varied line of machinery.

J. W. Daniels, president of the Archer-Daniels-Midland Co., was a visitor at the local offices of the company during the week.

Lord Leverhulme, Sir William Hesketh Lever, head of Lever Bros., arrived in New York last week.

Belgian Glass Industry Active

The plate-glass market in Belgium is unchanged and favorable, with producers engaged in increasing their manufacturing capacity. After a temporary slackening in demand for special glass, business is now improved and prices are advancing. The window-glass situation is unusually favorable for the season.

Vegetable Oils and Fats

Higher Market for Crude Cottonseed and Linseed Oils—Coconut Steady—Tallow Holds Firm

TRADERS in vegetable oils reported a fair volume of business, and, with stocks on hand light, a steady undertone prevailed in nearly all directions. Consumers were more disposed to take on material for December-January delivery. Advices from the Continent reported good buying of sesame oil by American interests and it is estimated that more than 20,000 bbl. of this oil will arrive here in the next three months. Tallow was less active, but steady. Oleo stearine lowered ¼c.

Cottonseed Oil—Reductions in estimated production of cotton more than offset the bearish Census Bureau's report on cottonseed products. The report, upon analysis, indicated smaller distribution of oil in October, the total for the month being 232,500 bbl., against 309,000 bbl. a year ago. Distribution for the first three months of the season reached the total of 604,000 bbl., which compares with 706,000 bbl. for the corresponding period a year ago. Private reports on the cotton crop place the yield at approximately 9,500,000 bales. Cotton advanced to new highs for the season and this led to renewed buying of oil on the part of Southern speculators, May refined selling above 12c. per lb. Crude cottonseed oil sold at 9¾c. per lb., tank cars, f.o.b. mills, which compares with 9½c. per lb. a week ago. Bleachable oil was firm at 10½c. per lb., tank cars, f.o.b., Texas common points. Sentiment in the option market was mixed, many taking the stand that current prices will curtail consumption of oil. Exports of cottonseed oil, crude and refined, for the three months ending October 31 amounted to 6,435,225 lb., which compares with 10,048,903 lb. a year ago. Lard compound trade was fair and prices ruled firm at 13¾@14c. per lb., carload lots, f.o.b. New York.

Linseed Oil—November-December oil was advanced 1c. per gal., the market closing at 91c., cooperage included, carload lots. On December-January one crusher named a price of 89c., with January-February at 88c. and March-April 87c. per gal. For March-June it was reported that 86c. could be shaded on a bid. Demand for nearby oil was fair, but consumers showed no buying interest in the distant positions. The fact that the Argentine has little seed to offer for prompt shipment strengthened the opinion of crushers on nearby material. Sentiment regarding futures, however, continues to favor buyers. Crop news from the Argentine, taken as a whole, was favorable and talk of a record crop persists. There is little doubt over the size of the 1922-23 crop, the output being slightly in excess of 50,000,000 bu. With the acreage this season 28 per cent larger, and weather conditions to date fully up to the average, expert opinion favors a crop in excess of 60,000,000 bu., which would provide more than enough seed to offset heavy gains in actual consumption of oil. Shipments of flaxseed from the Argentine since January 1 amounted to 42,800,000 bu., against 34,600,000 bu. a year ago. Total shipments out of India since the first of the year amounted to 13,800,000 bu., which compares with 11,150,000 bu. a year ago.

China Wood Oil—Market quiet, but steady at 21½c. asked, in bbl., New York. On the Pacific coast 20c. asked, tank car basis. Importations for the 9 months ending September 30 amounted to 9,760,990 gal., against 8,017,235 gal. a year ago.

Cottonseed and Cottonseed Products Statistics

Distribution of cottonseed oil in October, based on the Bureau of Census statistics for the 3 months which ended on Oct. 31, amounted to 232,500 bbl. This compares with 169,000 bbl. in September and 309,000 bbl. in October, 1922. Distribution for the 3 months' period amounted to 604,000 bbl., against 706,000 bbl. for the corresponding period a year ago.

The August-October figures on cottonseed and cottonseed products, with a comparison, follow:

	1923	1922
Seed received, ton	1,670,306	1,746,283
Seed crushed, ton	951,007	976,212
Crude oil mfd., lb.	277,056,163	291,698,859
Refd. oil mfd., lb.	174,199,689	175,961,437
Cake and meal, ton	434,689	440,874
Stocks, Oct. 31:		
Seed, ton	731,281	780,957
Crude oil, lb.	93,858,099	103,135,917
Refined oil, lb.	70,607,894	56,897,072

Coconut Oil—No important trading developed. Prices ruled steady. Ceylon type oil New York, sellers' tanks, closed at 8¾c. per lb., prompt and nearby shipment. On the Pacific coast 8½c. asked on November-December and 8¾c. asked on January forward, sellers' tanks.

Palm Oils—Demand moderate. Good grades Lagos for shipment sold at 7¾c. per lb., c.i.f. New York. High acid material available at 7½c. Niger steady at 7.20c. per lb., c.i.f. New York.

Soya Bean Oil—Offered at 9.65c. sellers' tanks, duty paid, Pacific coast ports. New York market nominal at 10¼@10½c. per lb., tank cars.

Fish Oils—Possibility of trading in crude menhaden at shade under 50c. per gal., tank, f.o.b. factory. Fishing off North Carolina good. English cod oil offered for shipment at 58½c. per gal.; Newfoundland firm at 68c. per gal.

Tallow, Etc.—Scattered lots of outside goods brought 8c., basis extra special. Demand less active, but undertone steady. Yellow grease, 33 per cent acid, sold at 6½c. loose, carload lots. Oleo stearine sold at 10¾c., decline of ¼c.

Miscellaneous Materials

Antimony—Demand has fallen off considerably and spot prices closed slightly lower, Chinese and Japanese brands being available at 9c. per lb., which compares with 9¼c. a week ago. Standard powdered needle antimony, 200 mesh, closed at 7@8c. per lb. White oxide, Chinese, 7½@8c. per lb.

Barytes—Market irregular, prices on the white floated ranging from $24@$26 per ton, carload lots, packages included, f.o.b. St. Louis. On crude prices ruled steady, holding at $8@$10 per ton, f.o.b. point of production.

Glycerine—Chemically pure glycerine was offered more freely, especially in the West, and the market was barely steady in some quarters of the trade. Prices heard ranged from 16½@16¾c. per lb., according to quantity. Dynamite was offered at 16c. per lb., carload basis, with intimation that bids at 16c. might result in business. Crude, soaplye, basis 80 per cent, held at 10½@10¾c. per lb., loose.

Naval Stores—Quiet prevailed in the market for spirits of turpentine and this was given as the reason for a reduction of 2c. per gal., the settling price being 94c. per gal., ex yard. Southern markets also were down. There was no change of importance in the rosin situation, contract deliveries being good and prices about steady on the basis of $5.80 per barrel on the lower grades.

Shellac—Weakness in exchange offset steadiness in prices at primary centers. Business here was moderate only and competition tends to keep prices down. T. N. closed nominally at 58@60c. per lb., according to quantity and seller. Importations of shellac for the 9 months ending with Sept. 30 amounted to 30,491,315 lb., which compares with 18,952,824 lb. for the corresponding period a year ago.

White Lead, Etc.—The official price on pig lead held at 6.85c. per lb., with the market firm. Consumption continued good and trade authorities expect prices to hold for some little time to come. The steadiness in the metal is a factor in the market for pigments, and, with no change in the acetic acid situation, corroders hold out no hopes for lower prices. Standard dry white lead was offered by leading interests on the carload basis of 9½c. per lb., with some outside brands available at slight concessions. Red lead, dry, in casks, held at 10½@10¾c. per lb.

Zinc Oxide—There was an easier market for the metal, but no important change in the ore. On zinc oxide first hands reported a steady market, but admitted that consumption has suffered somewhat by the less active state of the rubber industry. Paint manufacturers, however, continue to take on usual requirements. On the American process, lead free, 8c. represented the market with the leaded grades bringing from 7@7¼c. per lb. French process, red seal, held at 9¾c. per lb., with the green seal at 19¾c. and the white seal at 12c. per lb.

Imports at the Port of New York

November 16 to November 22

ACIDS—Formic— 140 bx., Rotterdam, R. W. Greeff & Co. **Oxalic**—48 csk., Christiania, Roessler & Hasslacher Chemical Co.

ALBUMEN—16 csk., Manchester, Order.

ALCOHOL—125 bbl. denatured, Arecibo, C. Esteva.

ANTIMONY—150 bbl. red, Havre, Heemsoth, Basse Co.; 770 bg., Antofagasta, W. R. Grace & Co.; 250 cs., Shanghai, Bank of America.

ANTIMONY OXIDE—250 cs., Shanghai, Bank of America.

ARSENIC—100 csk., Bremen, Bank of America; 10 keg, London, Order; 400 cs., Kobe, Gnavely & Co.; 360 bbl., Tampico, American Smelting & Refining Co.

BARYTES—200 bg., Bremen, New York Trust Co.; 301 bg., Bremen, E. L. Bullock & Sons; 200 bg., Bremen, P. Uhlich & Co.; 990,000 kilos, Bremen, Ore & Chemical Corp.

BLEACHING POWDER—75 cs., Liverpool, H. Kohnstamm & Co.

BRONZE POWDER—14 cs., Bremen, B. F. Drakenfeld & Co.; 42 cs., Bremen, Baer Bros.; 17 cs., Hamburg, Order; 15 cs., Bremen, Order; 16 cs., Hamburg, Uhlfelder & Co.; 12 cs., Hamburg, Order.

CALCIUM CHLORIDE—320 dr., Hamburg, Phillip Bauer & Co.

CASEIN—835 bg., Buenos Aires, International Acceptance Bank.

CAMPHOR—200 cs., Shanghai, Order; 100 pkg., Kobe, Suzuki & Co.

CHALK—400 bg., London, H. J. Baker & Bros.; 500 tons crude (bulk), London, Baring Bros. & Co.

CHEMICALS—48 csk., Bremen, Pfaltz & Bauer; 1,000 bg., Rotterdam, P. Uhlich & Co.; 193 csk., Rotterdam, Hummel & Robinson Corp.; 220 cs., Rotterdam, Order; 51 carboys and 23 pkg., Rotterdam, Order; 29 cs., Hamburg, Agfa Products Inc.; 560 bg., Glasgow, Coal & Iron National Bank; 58 dr., Hamburg, Jungmann & Co.; 173 dr., Hamburg, Speiden-Whitefield Co.; 31 bbl., Hamburg, A. Hurst & Co.

CHINA CLAY—622 tons (bulk), Bristol, Moore & Munger; 453 tons, Bristol, Papermakers Import Co.

COAL-TAR DISTILLATE—1 dr., Liverpool, Monsanto Chemical Works; 139 dr., Liverpool, Order.

COLORS—42 csk. earth, Bremen, Fezandie & Sperrle; 87 csk. do., Bremen, Heller & Merz; 3 csk., Rotterdam, Hensel, Bruckmann & Lorbacher; 96 pkg. coal-tar, Rotterdam, Kuttroff, Pickhardt & Co.; 2 csk., Rotterdam, H. A. Metz & Co.; 8 keg, Rotterdam, National City Bank; 8 bbl., Rotterdam, B. Bernard; 150 bg. earth, Leghorn, Order; 6 pkg. aniline, Hamburg, Franklin Import & Export Co.; 5 bbl. aniline, Genoa, L. R. Organic Products Co.; 3 bbl. do., Genoa, Backmeier & Co.; 15 csk. dry, Liverpool, Brown Bros. & Co.; 64 csk. aniline, Havre, Ciba Co.; 38 pkg. do., Havre, Sandoz Chemical Co.; 9 cs., Havre, Drakenfeld & Co.; 4 csk., Havre, Carbic Color & Chemical Co.; 5 cs., Havre, Richards & Co.; 3 csk. aniline, Havre, Order.

COPRA—21 bg., Colon, Franklin Baker Co.

DIVI-DIVI—160 bg., Aruna, E. Pavenstedt & Co.

DEXTRINE—200 bg., Rotterdam, Stein, Hall & Co.; 160 bg., Rotterdam, Brown Bros. & Co.

DYES—7 cs., Shanghai, National Aniline & Chemical Co.

EMERY — 662 tons (bulk), Smyrna, Order.

FULLERS EARTH—250 bg., Bristol, L. A. Salomon & Bros.

FUSEL OIL—3 dr., Rotterdam, De Mattia Chemical Co.; 21 dr., Rotterdam, Order; 1 cs., Cape Haiti, Texas Co.; 6 dr., Marseilles, Order; 16 dr., Genoa, Credito Italiano; 15 dr., Copenhagen, A. C. Lambard & Sons.

GLAUBER SALTS—200 bg., Hamburg, Order.

GUMS — 476 bg. copal, Matadi, L. C. Gillespie & Sons; 562 bg. copal, Matadi, Niger Co.; 150 cs. copal, 275 bskt. do., 100 cs. damar and 210 bg. do., Singapore, L. C. Gillespie & Sons; 192 bg. and 50 cs. damar, Singapore, Order; 142 bg. copal, Manila, H. Dubler; 25 cs. copal, Singapore, L. C. Gillespie & Sons; 130 bg. copal, Marseilles, Order.

IRON OXIDE—72 bbl. Malaga, J. M. Rabassa; 63 bbl., Malaga, Reichard-Coulston, Inc.; 253 bbl., Malaga, C. J. Osborn & Co.; 267 bbl., Malaga, Order; 1 csk., Liverpool, E. M. & F. Waldo; 10 csk. and 10 keg, Liverpool, J. H. Rhodes & Co.; 34 csk., Liverpool, R. J. Waddell & Co.; 35 csk., Liverpool, J. A. McNulty; 19 csk., Liverpool, L. H. Butcher & Co.

LAMPBLACK — 130 csk., Rotterdam, Order.

LOGWOOD—424,319 lb., Port au Prince, Stamford Dyewood Co.; 135 bbl., Cape Haiti, Logwood Mfg. Co.

LITHOPONE — 400 csk., Rotterdam, Order.

MAGNESITE—100 bg., Rotterdam, H. J. Baker & Bro.; 104 csk., Rotterdam, Order; 250 bg., Rotterdam, Speiden-Whitfield Co.

MAGNESIUM — 36 cs. calcined, Genoa, Order; 4 bbl. carbonate, Genoa, Order; 8 cs. superoxide, Hamburg, Interocean Forwarding Co.; 711 dr. chloride, Hamburg, Irving Bank-Col. Trust Co.; 175 dr. chloride, Hamburg, Innes, Speiden & Co.

MYROBALANS — 3,475 pkt., Calcutta, Order; 5,460 pkt., Calcutta, Order.

NAPHTHALENE—499 bg. crude, Manchester, Order; 216 bg., Bristol, Order.

OCHER—24 bbl. Malaga, C. J. Osborn & Co.

OILS—Cod—100 csk., St. Johns, Order. **China Wood**—140 csk., Hankow, Sino-Java Handelsverg. **Coconut**—825 tons (bulk), Manila, Philippine Refining Co. **Palm**—223 csk., Rotterdam, African & Eastern Trading Co. **Peanut**—35 csk., Rotterdam, W. Van Doorn; 80 cs., Hong Kong, Kwong Tai Chong. **Sesame**—115 bbl., Rotterdam, J. P. Grant & Co. **Sod**—15 bbl., Liverpool, R. Badcock & Co.; 2 bbl., Liverpool, J. Curtis & Co. **Sperm**—150 bbl., Glasgow, Order.

OIL SEEDS—Castor—20 bg., Port De Paix, Huttlinger & Struller.

PHOSPHORUS—200 cs., Havre, W. E. Miller.

PLUMBAGO—208 bbl., Colombo, H. P. Winter & Co.; 200 bbl., Colombo, National City Bank.

POTASSIUM SALTS—112 dr. caustic, Hamburg, Roessler & Hasslacher Chemical Co.; 109 cs. bromide, Hamburg, Superfos Corp.; 16 keg prussiate, Liverpool, C. Tennant & Sons Co.; 10 csk. prussiate, Liverpool, Order; 392 csk. nitrate, Hamburg, Kuttroff, Pickhart & Co.; 300 cs. perchlorate, Copenhagen, Fidelity International Trust Co.

QUEBRACHO—1,957 bg., Buenos Aires, Bank of New York & Trust Co.; 5,092 bg., Buenos Aires, Guaranty Trust Co.; 6,514 bg., Buenos Aires, Order.

QUICKSILVER — 500 flasks, Hamburg, Italian Discount & Trust Co.

ROCHELLE SALT—99 csk., Rotterdam, Order.

SAL AMMONIAC — 192 bbl., Hamburg, National American Bank.

SHELLAC—50 bg., Calcutta, London & Brazilian Bank; 50 bg., Calcutta, American Exchange National Bank; 1,247 bg. and 100 cs., Calcutta, Order; 150 bg., Hamburg, Ralli Bros.; 14 cs., Hamburg, Core & Herbert; 40 bg., Hamburg, Kasebier-Chatfield Shellac Co.; 85 bg. garnet, Hamburg, Order; 10 cs., Hamburg, C. F. Gerlach & Co.; 800 bg., Calcutta, Anglo-South American Bank; 300 bg., Calcutta, British Oversea Bank; 150 bg. refuse, Calcutta, Bank of the Manhattan Co.; 2,529 bg. shellac and 152 bg. seedlac, Calcutta, Order.

SILVER SULPHIDE — 3 cs., Callao, Markt, Schafer & Co.

SODIUM SALTS—5,729 bg. nitrate, Antofagasta, Wessel, Duval & Co.; 4,210 bg. do., Antofagasta, E. I. Du Pont de Nemours & Co.; 13,775 bg. do., Taltal, E. I. Du Pont de Nemours & Co.; 250 csk. hyposulphite, Hamburg, Agfa Products, Inc.; 42,772 bg. nitrate, Callao, Wessel, Duval & Co.; 101,176 bg. nitrate, Mejillones, A. Gibbs & Co.; 250 csk. nitrate, Hamburg, Order; 91 csk. nitrite, Christiania, Order.

STARCH — 500 bg., Rotterdam, Stein, Hall & Co.; 50 bbl., Rotterdam, J. Morningstar & Co.; 500 bg. potato, Rotterdam, Order.

STRONTIUM SPAR—110 tons, Bristol, Order.

TALC—200 bg., Genoa, C. B. Chrystal & Co.; 300 bg., Genoa, H. Mathieu; 200 bg., Genoa, C. B. Chrystal & Co.

TARTAR—403 bg., Buenos Aires, Anglo-South American Bank; 150 csk., Naples, Tartar Chemical Co.

VALONEA—1,253 sk., Smyrna, Order.

VANADIUM—1,200 sk., Callao, Vanadium Corp.

VERMILION—7 csk. and 5 cs., London, Pomeroy & Fisher.

WAXES — 195 bg. montan, Hamburg, Fidelity International Trust Co.; 86 bg. bees, Valparaiso, D. Steengrafe; 30 bg. bees, Talcahuano, Order.

WHITING — 5,538 bg. powdered, Dunkirk, Taintor Trading Co.

WOOL GREASE — 191 csk., Bremen, Hummel & Robinson.

ZINC OXIDE—33 cs., Liverpool, L. H. Butcher & Co.

ZINC RESINATE—10 cs., London, Order.

ZINC SULPHATE—2 csk., London, C. A. Sykes.

Latest Quotations on Industrial Stocks

	Last Week	This Week
Air Reduction	68	67½
Allied Chem. & Dye	65⅝	66¼
Allied Chem. & Dye pfd	107½	108
Am. Ag. Chem.	12⅝	13
Am. Ag. Chem. pfd.	37½	36⅝
American Cotton Oil	6½	8½
American Cotton Oil pfd.	20⅝	25½
American Cyanamid	77	•83
Am. Drug Synd.	5⅞	5⅝
Am. Linseed Co.	17½	17½
Am. Linseed pfd.	34½	34
Am. Smelting & Refining Co.	58½	59⅜
Am. Smelting & Refining pfd.	96	95¾
Archer-Daniels Mid. Co., w.i.	22⅞	23
Archer-Daniels Mid. Co. pfd.	89	91
Atlas Powder	54	52
Casein Co. of Am.	•64	
Certain-Teed Products	35	35
Commercial Solvents "A"	•34	•40
Corn Products	128⅜	131½
Corn Products pfd.	•119	•119½
Davison Chem.	57⅜	74
Dow Chem. Co.	•45	•47
Du Pont de Nemours	128¼	129⅜
Du Pont de Nemours db.	85	86
Freeport-Texas Sulphuric	11½	12⅛
Glidden Co.	6⅛	10
Grasselli Chem.	•132	•132
Grasselli Chem. pfd.	•145	•145
Hercules Powder	•106	•110
Hercules Powder pfd.	•103	•104
Heyden Chem.	1⅜	•1½
Int'l Ag. Chem. Co.	1	1¼
Int'l Ag. Chem. pfd.	5½	6½
Int'l Nickel	11⅜	11½
Int'l Nickel p..fd.	80	81
Int'l Salt	•86	•85½
Mathieson Alkali	35¼	39¾
Merck & Co.	•70	•67
National Lead	•124⅜	127½
National Lead pfd.	•112	112½
New Jersey Zinc	•140	•145
Parke, Pavis & Co.	77⅜	•78
Pennsylvania Salt	92⅝	•91½
Procter & Gamble	•135	•135
Sherwin-Williams	•31	•29½
Sherwin-Williams pfd.	•100	•100
Tenn. Copper & Chem.	•9	9
Texas Gulf Sulphur	62⅜	61½
Union Carbide	55½	55½
United Drug	77½	78
United Dyewood	•45	•41
U. S. Industrial Alcohol	59	61¼
U. S. Industrial Alcohol pfd.	•98	•98
Va.-Car. Chem. Co.	8½	9½
Va.-Car. Chem. pfd.	25½	29⅝

•Nominal. Other quotations based on last sale.

Current Prices in the New York Market

For Chemicals, Oils and Allied Products

THESE prices are for the spot market in New York City, but a special effort has been made to report American manufacturers' quotations whenever available. In many cases these are for material f.o.b. works or on a contract basis and these prices are so designated. Quotations on imported stocks are reported when they are of sufficient importance to have a material effect on the market. Prices quoted in these columns apply to large quantities in original packages.

General Chemicals

Acetone, drums	lb.	$0.25 – $0.25½
Acetic anhydride, 85%, dr.	lb.	.38 – ....
Acid, acetic, 28%, bbl.	100 lb.	3.38 – 3.63
Acetic, 56%, bbl.	100 lb.	6.75 – 7.00
Acetic, 80%, bbl.	100 lb.	9.58 – 9.83
Glacial, 99½%, bbl.	100 lb.	12.00 – 12.78
Boric, bbl.	lb.	.10 – ....
Citric, kegs	lb.	.47½ – .49
Formic, 85%	lb.	.12 – .14
Gallic, tech.	lb.	.45 – .50
Hydrofluoric, 52%, carboys	lb.	.11 – .12
Lactic, 44%, tech., light, bbl.	lb.	.11½ – .12
22% tech., light, bbl.	lb.	.05½ – .06
Muriatic, 18° tanks	100 lb.	.90 – 1.00
Muriatic, 20°, tanks	100 lb.	1.00 – 1.10
Nitric, 36°, carboys	lb.	.04½ – .05
Nitric, 42°, carboys	lb.	.05½ – .05½
Oleum, 20%, tanks	ton	18.50 – 19.00
Oxalic, crystals, bbl.	lb.	.11½ – .12½
Phosphoric, 50% carboys	lb.	.07½ – .08½
Pyrogallic, resublimed	lb.	1.50 – 1.60
Sulphuric, 60°, tanks	ton	9.00 – 11.00
Sulphuric, 60°, drums	ton	13.00 – 14.00
Sulphuric, 66°, tanks	ton	15.00 – 16.00
Sulphuric, 66° drums	ton	20.00 – 21.00
Tannic, U.S.P., bbl.	lb.	.65 – .70
Tannic, tech., bbl.	lb.	.45 – .50
Tartaric, imp., powd., bbl.	lb.	.28 – .28½
Tartaric, domestic, bbl.	lb.	.32½ – ....
Tungstic, per lb.	lb.	1.10 – 1.20
Alcohol, butyl, drums, f.o.b. works	lb.	.26 – .28
Alcohol ethyl (Cologne spirit), bbl.	gal.	4.81 – ....
Ethyl, 190 p'f. U.S.P., bbl.	gal.	4.78 – ....
Alcohol, methyl (see Methanol)		
Alcohol, denatured, 190 proof		
No. 1, special bbl.	gal.	.51½ – ....
No. 1, 190 proof, special, dr.	gal.	.45½ – ....
No. 1, 188 proof, bbl.	gal.	.52½ – ....
No. 1, 188 proof, dr	gal.	.48½ – ....
No. 5, 188 proof, bbl.	gal.	.50½ – ....
No 5, 188 proof, dr.	gal	.44½ – ....
Alum, ammonia, lump, bbl.	lb.	.03½ – .04
Potash, lump, bbl.	lb.	.03 – .03½
Chrome, lump, potash, bbl.	lb.	.05½ – .06½
Aluminum sulphate, com., bags	100 lb.	1.40 – 1.50
Iron free bags	lb.	2.40 – 2.50
Aqua ammonia, 26°, drums	lb.	.07 – .07½
Ammonia, anhydrous, cyl.	lb.	.30 – .30½
Ammonium carbonate, powd. tech., casks	lb.	.09 – .09½
Ammonium nitrate, tech., casks	lb.	.09 – .10
Amyl acetate tech., drums	gal.	4.50 – 4.75
Antimony Sulphuret, golden	lb.	.19 – .20
Arsenic, white, powd., bbl.	lb.	.13½ – .14½
Arsenic, red, powd., kegs	lb.	.15 – .15½
Barium carbonate, bbl.	ton	72.00 – 75.00
Barium chloride, bbl.	ton	83.00 – 90.00
Barium dioxide, 88%, drums	lb.	.17½ – .18
Barium nitrate, casks		.07½ – .08
Blanc fixe, dry, bbl.	lb.	.04 – .04½
Bleaching powder, f.o.b. wks., drums	100 lb.	1.25 – ....
Spot N. Y. drums	100 lb.	1.75 – ....
Borax, bbl.	lb.	.05½ – .05½
Bromine, cases	lb.	.28 – .30
Calcium acetate, bags	100 lb.	4.00 – 4.05
Calcium arsenate, dr.	lb.	.12 – .14
Calcium carbide, drums	lb.	.05 – .05½
Calcium chloride, fused, dr. wks.	ton	21.00 – ....
Gran. drums works	ton	27.00 – ....
Calcium phosphate, mono, bbl.	lb.	.06½ – .07
Camphor, cases	lb.	.86 – .86½
Carbon bisulphide, drums	lb.	.06 – .06½
Carbon tetrachloride, drums	lb.	.09 – .09½
Chalk, precip.—domestic, light, bbl.	lb.	.04½ – .04½
Domestic, heavy, bbl.	lb.	.03½ – .04
Imported, light, bbl.	lb.	.04½ – .05
Chlorine, liquid, tanks, wks.	lb.	.04 – .04½
Contract, tanks, wks.	lb.	.03½ – ....
Cylinders, 100 lb., wks.	lb.	.05½ – .06
Cylinders, 100 lb., spot	lb.	.08½ – .09
Chloroform, tech., drums	lb.	.30 – .32
Cobalt, oxide, bbl.	lb.	2.10 – 2.25
Copperas, bulk, f.o.b. wks.	ton	20.00 – 21.00
Copper carbonate, bbl.	lb.	.18 – .19
Copper cyanide, drums	lb.	.47 – .50
Coppersulphate, dom., bbl.,	100 lb.	4.90 – 5.00
Imp bbl.	100 lb.	4.50 – ....
Cream of tartar, bbl.	lb.	.22½ – .25½
Epsom salt, dom., tech., bbl.	100 lb.	1.75 – 2.00
Epsom salt, imp., tech., bags	100 lb.	1.00 – ....
Epsom salt, U.S.P., dom., bbl.	100 lb.	2.25 – 2.50
Ether, U.S.P., resale, dr.	lb.	.13 – .15
Ethyl acetate, 85%, drums	gal.	.97 – ....
Ethyl acetate, 99%, dr.	gal.	$1.12 – $1.15
Formaldehyde, 40%, bbl.	lb.	.11 – .11½
Fullers earth—f..o.b. mines	ton	18.00 – 20.00
Fusel oil, ref., drums	gal.	.... – ....
Fusel oil, crude, drums	gal.	4.15 – 4.25
Glaubers salt, wks., bags	100 lb.	1.20 – 1.40
Glaubers salt, imp., bags	100 lb.	.90 – .95
Glycerine, c.p., drums extra	lb.	.16½ – .17
Glycerine, dynamite, drums	lb.	.16 – .16½
Glycerine, crude 80%, loose	lb.	.10½ – .10¾
Iron oxide, red, casks	lb.	.12 – .18
Lead:		
White, basic carbonate, dry, casks	lb.	.09½ – .09½
White, basic sulphate, casks	lb.	.08½ – .09
White, in oil, kegs	lb.	.11½ – .11½
Red, dry, casks	lb.	.10½ – .10½
Red, in oil, kegs	lb.	.13 – .14½
Lead acetate, white crys., bbl.	lb.	.14 – .14½
Brown, broken, casks	lb.	.13 – .13½
Lead arsenate, powd., bbl.	lb.	.18 – .20
Lime-Hydrated, bg, wks.	ton	10.50 – 12.50
Bbl., wks.	ton	18.00 – 19.00
Lime, Lump, bbl.	280 lb.	3.63 – 3.65
Litharge, comm., casks	lb.	.10½ – .10½
Lithopone, bags	lb.	.07 – .07½
in bbl.	lb.	.07½ – .07½
Magnesium carb., tech., bags	lb.	.08½ – .08½
Methanol, 95%, bbl.	gal.	.93 – ....
Methanol, 97%, bbl.	gal.	.95 – ....
Methanol, pure, tanks	gal.	.90 – ....
drums	gal.	1.00 – ....
bbl	gal.	1.05 – ....
Methyl-acetone, t'ks.	gal.	1.15 – ....
Nickel salt, double, bbl.	lb.	.10½ – ....
Nickel salts, single, bbl.	lb.	.11½ – ....
Phosgene		.60 – .75
Phosphorus, red, cases	lb.	.... – ....
Phosphorus, yellow, cases	lb.	.35 – .40
Potassium bichromate, casks	lb.	.09½ – ....
Potassium bromide, gran., bbl.	lb.	.19 – .20
Potassium carbonate, 80-85%, calcined, casks	lb.	.06½ – .06½
Potassium chlorate, powd.	lb.	.07½ – .08½
Potassium cyanide, drums	lb.	.47 – 52
Potassium, first sorts, cask	lb.	.08½ – .08½
Potassium hydroxide (caustic potash) drums	lb.	.06½ – .07
Potassium iodide, cases	lb.	3.65 – 3.75
Potassium nitrate, bbl.	lb.	.07½ – .09
Potassium permanganate, drums	lb.	.17 – .17½
Potassium prussiate, red, casks	lb.	.55 – .56
Potassium prussiate, yellow casks	lb.	.25 – .25½
Salammoniac, white, gran., casks, imported	lb.	.06½ – .06½
Salammoniac, white, gran., bbl., domestic	lb.	.07½ – .07½
Gray, gran., casks	lb.	.08 – .09
Salsoda, bbl.	100 lb.	1.20 – 1.40
Salt cake (bulk)	ton	22.00 – 23.00
Soda ash, light, 58% flat, bulk, contract	100 lb.	1.25 – ....
bags, contract	100 lb.	1.38 – ....
Soda ash, dense, bulk, contract, basis 58%	100 lb.	1.35 – ....
bags, contract	100 lb.	1.45 – ....
Soda, caustic, 76%, solid, drums contract	100 lb.	3.10 – ....
Soda, caustic, ground and flake, contracts, dr.	100 lb.	3.50 – 3.85
Soda, caustic, solid, 76% f. a.s. N. Y.	100 lb.	3.00 – 3.10
Sodium acetate, works, bbl.	lb.	.05½ – .05½
Sodium bicarbonate, bulk	100 lb.	1.75 – ....
330-lb. bbl.	100 lb.	2.00 – ....
Sodium bichromate, casks	lb.	.07½ – .07½
Sodium bisulphate (niter cake)	ton	6.00 – 7.00
Sodium bisulphite, powd., U.S.P., bbl.	lb.	.04½ – .04½
Sodium chlorate, kegs	lb.	.06½ – .07
Sodium chloride	long ton	12.00 – 13.00
Sodium cyanide, cases	lb.	.19 – .22
Sodium fluoride, bbl.	lb.	$0.08½ – $0.10½
Sodium hyposulphite, bbl.	lb.	.02½ – .02
Sodium nitrite, casks	lb.	.07½ – ....
Sodium peroxide, powd., cases	lb.	.28 – .30
Sodium phosphate, dibasic, bbl.	lb.	.03½ – .04
Sodium prussiate, yel. drums	lb.	.11½ – .11½
Sodium salicylic, drums	lb.	.40 – .42
Sodium silicate (40°, drums)	100 lb.	.75 – 1.15
Sodium silicate (60°, drums)	100 lb.	1.75 – 2.00
Sodium sulphide, fused, 60-62% drums	lb.	.03 – .04
Sodium sulphite, crys., bbl.	lb.	.03½ – .03½
Strontium nitrate, powd., bbl.	lb.	.11½ – .12
Sulphur chloride, yel drums	lb.	.04½ – .05
Sulphur, crude	ton	18.00 – 20.00
At mine, bulk	ton	16.00 – 18.00
Sulphur, flour, bag	100 lb.	2.25 – 2.35
Sulphur, roll, bag	100 lb.	2.00 – 2.10
Sulphur dioxide, liquid, cyl.	lb.	.08 – .08½
Tin bichloride, bbl.	lb.	.12½ – .13
Tin oxide, bbl.	lb.	.47 – ....
Tin crystals, bbl.	lb.	.32 – .32½
Zinc carbonate, bags	lb.	.14 – .14½
Zinc chloride, gran, bbl.	lb.	.06½ – .06½
Zinc cyanide, drums	lb.	.37 – .38
Zinc oxide, , lead free, bbl.	lb.	.08 – .08½
5% lead sulphate, bags	lb.	.07½ – ....
10 to 35 % lead sulphate, bags	lb.	.07 – ....
French, red seal, bags	lb.	.09½ – ....
French, green seal, bags	lb.	.10½ – ....
French, white seal, bbl	lb.	.12 – ....
Zinc sulphate, bbl.	100 lb.	2.75 – 3.25

Coal-Tar Products

Alpha-naphthol, crude, bbl.	lb.	$0.60 – $0.70
Alpha-naphthol, ref., bbl.	lb.	.65 – .80
Alpha-naphthylamine, bbl.	lb.	.35 – .36
Aniline oil, drums	lb.	.16 – .16½
Aniline salts, bbl.	lb.	.23 – .23½
Anthracene, 80%, drums	lb.	.75 – .80
Anthracene, 80%, imp., drums, duty paid	lb.	.65 – .70
Anthraquinone, 25%, paste, drums	lb.	.80 – .85
Benzaldehyde U.S.P., carboys	lb.	1.50 – ....
f.f.c. drums	lb.	1.60 – ....
tech, drums	lb.	75 ....
Benzene, pure, water-white, tanks, works	gal.	.23 – ....
Benzene, 90%, tanks, works	gal.	.21 – ....
Benzidine base, bbl.	lb.	.80 – .85
Benzidine sulphate, bbl.	lb.	.75 – ....
Benzoic acid, U.S.P., kegs	lb.	.80 – 80
Benzoate of soda, U.S.P., bbl.	lb.	.65 – 70
Benzyl chloride, 95-97%, ref., carboys	lb.	.40 – ....
Benzyl chloride, tech., drums	lb.	.25 – ....
Beta-naphthol, tech., bbl.	lb.	.25 – .26
Beta-naphthylamine, tech.	lb.	.75 – 80
Cresol, U.S.P., drums	lb.	.25 – 29
Ortho-cresol, drums	lb.	.28 – 32
Cresylic acid, 97%, works drums	gal.	.75 – .85
95-97%, drums, works	gal.	.70 – 75
Dichlorbenzene, drums	lb.	.06 – .08
Diethylaniline, drums	lb.	.50 – .60
Dimethylaniline, drums	lb.	.40 – .41
Dinitrobenzene, bbl.	lb.	.18 – 20
Dinitrochlorbenzene, bbl.	lb.	.21 – .22
Dinitronaphthalen, bbl.	lb.	.30 – .32
Dinitrophenol, bbl.	lb.	.35 – .40
Dinitrotoluen, bbl.	lb.	.20 – .22
Dip oil, 25%, drums	gal.	.25 – .30
Diphenylamine, bbl.	lb.	.50 – .52
H-acid, bbl.	lb.	.75 – .80
Meta-phenylenediamine, bbl.	lb	1.00 – 1.05
Michlers ketone, bbl.	lb.	3.00 – 3.50
Monochlorbenzene, drums	lb.	.08 – .10
Monoethylaniline, drums	lb.	.95 – 1.10
Naphthalene, flake, bbl.	lb.	.06 – .06½
Naphthalene, balls, bbl.	lb.	.06½ – .07
Naphthionate of soda, bbl.	lb.	.60 – .65
Naphthionic acid, crude, bbl.	lb.	.55 – .60
Nitrobenzene, drums	lb.	.09½ – .10½
Nitro-naphthalene, bbl.	lb.	.30 – .35
Nitro-toluene, drums	lb.	.13½ – .14½
N-W acid, bbl.	lb.	1.10 – 1.15
Ortho-amidophenol, kegs	lb.	2.30 – 2 35
Ortho-dichlorbenzene, drums	lb.	.15 – 17
Ortho-nitrophenol, bbl.	lb.	1.20 – 1.30
Ortho-nitrotoluene, drums	lb.	.10 – .12
Ortho-toluidine, bbl.	lb.	.14 – .16
Para-amifiophenol, base, kegs	lb.	1.30 – ....
Para-amifiophenol, HCl, kegs	lb.	1.55 – ....
Para-dichlorbenzene, bbl.	lb.	.17 – .20
Paranitroaniline, bbl.	lb.	.73 – .74
Para-nitrotoluene, bbl.	lb.	.60 – .65
Para-phenylenediamine, bbl.	lb.	1.45 – 1.50
Para-toluidine, bbl	lb.	.90 – .95
Phthalic anhydride, bbl.	lb.	.30 – .34
Phenol, U.S.P., dr.	lb.	.25 – .26
Picric acid, bbl.	lb.	.20 – .22
Pyridine, dom., drums	gal.	nominal
Pyridine, imp., drums	gal.	5.25 – 5.50
Resorcinol, tech., kegs	lb.	1.40 – 1.50

Resorcinol, pure, kegs	lb.	$2.15 –	....
R-salt, bbl	lb.	.55 –	.60
Salicylic acid, tech., bbl	lb.	.32 –	....
Salicylic acid, U.SP., bbl	lb.	.35 –	....
Solvent naphtha, water-white, tanks	gal.	.23 –	....
Crude, tanks	gal.	.20 –	....
Sulphanilic acid, crude, bbl	lb.	.18 –	.20
Thiocarbanilide, kegs	lb.	.35 –	.38
Tolidine, bbl	lb.	1.00 –	1.05
Toluidine, mixed, kegs	lb.	.30 –	.35
Toluene, tank cars, works	gal.	.24 –	....
Toluene, drums, works	gal.	.29 –	....
Xylidine, drums	lb.	.50 –	....
Xylene, pure, drums	gal.	.50 –	.55
Xylene, com., drums	gal.	.34 –	....
Xylene, com., tanks	gal.	.29 –	....

Naval Stores

Rosin B-D, bbl. 280 lb.		$5.80 –	.....
Rosin E-I, bbl. 280 lb.		5.80 –	.....
Rosin K-N, bbl. 280 lb.		5.85 –	$6.10
Rosin W.G.-W.W., bbl. 280 lb.		6.65 –	7.00
Wood rosin bbl. 280 lb.		5.90 –	6.00
Turpentine, spirits of, bbl.	gal.	.94 –	.....
Wood, steam dist., bbl.	gal.	.85 –	.....
Wood, dest. dist., bbl.	gal.	.70 –	.....
Pine tar pitch, bbl. 200 lb.		6.50 –	.....
Tar, kiln burned, bbl. 500 lb.		11.00 –	.....
Retort tar, bbl. 500 lb.		11.00 –	.....
Rosin oil, first run, bbl.	gal.	.45 –	.....
Rosin oil, second run, bbl.	gal.	.47 –	.....
Rosin oil, third run, bbl.	gal.	.50 –	.....
Pine oil, steam dist.	gal.	.65 –	.....
Pine oil, pure, dest. dist.	gal.	.60 –	.....
Pine tar oil, ref.	gal.	.48 –	.....
Pine tar oil, crude, tanks f.o.b. Jacksonville, Fla.	gal.	.32 –	.32½
Pine tar oil, double ref., bbl.	gal.	..... –	.75
Pine tar, ref., thin, bbl.	gal.	..... –	.25
Pinewood creosote, ref., bbl.	gal.	..... –	.52

Animal Oils and Fats

Degras, bbl	lb.	$0.04 –	$0.04½
Grease, yellow, loose	lb.	.06½ –	.06¾
Lard oil, Extra No. 1, bbl.	gal.	.85 –	.....
Neatsfootoil 20 deg. bbl.	gal.	1.32 –	.....
No. 1, bbl.	gal.	.94 –	.96
Oleo Stearine		.10½ –	.....
Oleo oil, No. 1, bbl.	lb.	.15 –	.15½
Red oil, distilled, d.p. bbl.	lb.	.08½ –	.09½
Saponified, bbl.	lb.	.08¼ –	.09½
Tallow, extra, loose	lb.	.08 –	.....
Tallow oil, acidless, bbl.	gal.	.86 –	.88

Vegetable Oils

Castor oil, No. 3, bbl.	lb.	$0.13½ –	.....
Castor oil, No. 1, bbl.	lb.	.14 –	.....
Chinawood oil, bbl.	lb.	.21½ –	.....
Coconut oil, Ceylon, bbl.	lb.	.09½ –	.....
Ceylon, tanks, N.Y.	lb.	.08½ –	.....
Coconut oil, Cochin, bbl.	lb.	.10 –	.....
Corn oil, crude, bbl.	lb.	.11½ –	.12
Crude, tanks, (f.o.b. mill)	lb.	.10½ –	.....
Cottonseed oil, crude (f.o.b. mill), tanks	lb.	.09½ –	....
Summer yellow, bbl.	lb.	.12½ –	.13
Winter yellow, bbl.	lb.	.13½ –	.13½
Linseed oil, raw, car lots, bbl.	gal.	.91 –	.....
Raw, tank cars (dom.)	gal.	.85 –	.....
Boiled, cars, bbl. (dom.)	gal.	.93 –	.....
Olive oil, denatured, bbl.	gal.	1.10 –	1.12
Sulphur, (foots) bbl.	lb.	.08¼ –	.08½
Palm, Lagos, casks	lb.	.07½ –	.....
Niger casks	lb.	.07 –	.....
Palm kernel, bbl.	lb.	.08¼ –	.08½
Peanut oil, crude, tanks (mill)	lb	.12 –	....
Peanut oil, refined, bbl.	lb.	.14 –	....
Perilla, bbl	lb.	.14½ –	.14¾
Rapeseed oil, refined, bbl.	gal.	.75 –	.76
Rapeseed oil, blown, bbl.	gal.	.82 –	.....
Sesame, bbl	lb.	.12½ –	.12¾
Soya bean (Manchurian), bbl.	lb.	.11 –	.....
Tank, f.o.b. Pacific coast	lb.	.09½ –	.....
Tank, (f.o.b. N.Y.)	lb.	.10¼ –	.....

Fish Oils

Cod, Newfoundland, bbl.	gal.	$0.68 –	.....
Menhaden, light pressed, bbl.	gal.	.64 –	.....
White bleached, bbl.	gal.	.66 –	.....
Blown, bbl.	gal.	.70 –	.....
Crude, tanks (f.o.b. factory)	gal.	.48 –	.50
Whale No. 1 crude, tanks, coast	lb.	..... –	.....
Winter, natural, bbl.	gal.	.75 –	.76
Winter, bleached, bbl.	gal.	.78 –	.79

Oil Cake and Meal

Coconut cake, bags	ton	$34.00 –	....
Cottonseed meal, f.o.b. mills	ton	42.00 –	....
Linseed cake, bags	ton	40.00 –	....
Linseed meal, bags	ton	44.00 –	....

Dye & Tanning Materials

Albumen, blood, bbl.	lb.	$0.45 –	$0.50
Albumen, egg, tech, kegs	lb.	.95 –	.97
Cochineal, bags	lb.	.32 –	.34
Cutch, Borneo, bales	lb.	.04 –	.04½
Cutch, Rangoon, bales	lb.	.15 –	.16
Dextrine, corn, bags 100 lb.		3.89 –	4.10
Dextrine, gum, bags 100 lb.		4.17 –	4.44
Divi-divi, bags	ton	38.00 –	39.00
Fustic, sticks	ton	30.00 –	35.00
Fustic, chips, bags	lb.	.04 –	.05
Gambier com. cs	lb.	.08½ –	.09
Logwood, sticks	ton	25.00 –	26.00
Logwood, chips, bags	lb.	.02½ –	.03
Sumac, leaves, Sicily, bags	ton	80.00 –	85.00
Sumac, ground, bags	ton	$75.00 –	$80.00
Sumac, domestic, bags	ton	40.00 –	42.00
Starch, corn, bags 100 lb.		3.32 –	3.42
Tapioca flour, bags	lb.	.07 –	.07½

Extracts

Archil, cone., bbl.	lb.	$0.16½ –	$0.20
Chestnut, 25% tannin, tanks	lb.	.02 –	.03
Divi-divi, 25% tannin, bbl.	lb.	.04 –	.05
Fustic, crystals, bbl.	lb.	.20 –	.22
Fustic, liquid, 42°, bbl.	lb.	.08 –	.09
Gambier, liq., 25% tannin, bbl.	lb.	.09 –	.09½
Hematine crys., bbl.	lb.	.14 –	.18
Hemlock, 25% tannin, bbl.	lb.	.03½ –	.04
Hypernic, solid, drums	lb.	.24 –	.26
Hypernic, liquid, 51°, bbl.	lb.	.09½ –	.10½
Logwood, crys., bbl.	lb.	.14 –	.15
Logwood, liq., 51°, bbl.	lb.	.07½ –	.08
Quebracho, solid, 65% tannin, bbl.	lb.	.04½ –	.05
Sumac, dom., 51°, bbl.	lb.	.06½ –	.07½

Dry Colors

Blacks–Carbongas, bags, f.o.b. works, spot	lb.	$0.14 –	$0.18
Lampblack, bbl.	lb.	.12 –	.40
Mineral, bulk	ton	35.00 –	45.00
Blues–Bronze, bbl.	lb.	.45 –	.50
Prussian, bbl.	lb.	.45 –	.50
Ultramarine, bbl.	lb.	.08 –	.35
Browns, Sienna, Ital., bbl.	lb.	.06 –	.14
Sienna, Domestic, bbl.	lb.	.03½ –	.04
Umber, Turkey, bbl.	lb.	.04 –	.04½
Greens–Chrome, C.P. Light, bbl.	lb.	.28 –	.30
Chrome, commercial, bbl.	lb.	.12 –	.12½
Paris, bulk	lb.	.27 –	.28
Reds Carmine No. 40, tins	lb.	4.50 –	4.70
Oxide red, casks	lb.	.10 –	.14
Para toner, kegs	lb.	1.00 –	1.10
Vermilion, English, bbl.	lb.	1.15 –	1.20
Yellow, Chrome, C.P. bbls.	lb.	.18 –	...
Ocher, French, casks	lb.	.02½ –	.03

Waxes

Bayberry, bbl.	lb.	$0.25 –	$0.26
Beeswax, crude, Afr. bg.	lb.	.22 –	...
Beeswax, refined, light, bags	lb.	.32 –	.34
Beeswax, pure white, cases	lb.	.40 –	.41
Candelilla, bags	lb.	.23½ –	.24
Carnauba, No. 1, bags	lb.	.36 –	.38
No. 2, North Country, bags	lb.	.23½ –	.24
No. 3, North Country, bags	lb.	.16½ –	.17
Japan, cases	lb.	.16 –	.16½
Montan, crude, bags	lb.	.05 –	...
Paraffine, crude, match, 105-110 m.p., bbl.	lb.	.04½ –	.04¾
Crude, scale 124-126 m.p. bags	lb.	.03 –	....
Ref., 118-120 m.p., bags	lb.	.03½ –	....
Ref., 125 m.p., bags	lb.	.03¾ –	....
Ref, 128-130 m.p., bags	lb.	.04 –	....
Ref., 133-135 m.p., bags	lb.	.04¾ –	.05
Ref., 135-137 m.p., bags	lb.	.05½ –	...
Stearic acid, agle pressed, bags	lb.	.12½ –	.12¾
Double pressed, bags	lb.	.13 –	.13½
Triple pressed, bags	lb.	.14½ –	.14¾

Fertilizers

Ammonium sulphate, bulk f.o.b. works 100 lb.		$3.00 –	.....
Blood, dried, bulk	unit	4.40 –	$4.60
Bone, raw, 3 and 50, ground	ton	28.00 –	30.00
Fish scrap, dom., dried, wks.	unit	4.20 –	.....
Nitrate of soda, bags 100 lb.		2.42½ –	2.45
Tankage, high grade, f.o.b. Chicago	unit	3.25 –	3.35
Phosphate rock, f.o.b. mines, Florida pebble, 68-72%	ton	4.00 –	4.50
Tennessee, 78-80%	ton	7.75 –	8.00
Potassium muriate, 80%, bags	ton	34.55 –	.....
Potassium sulphate, bags basis 90%	ton	43.67 –	.....
Double manure salt	ton	25.72 –	.....
Kainit	ton	7.22 –	.....

Crude Rubber

Para—Upriver fine	lb.	$0.24 –	.....
Upriver coarse	lb.	.19½ –	.....
Upriver caucho ball	lb.	.20 –	.....
Plantation—First latex crepe	lb.	.28 –	.....
Ribbed smoked sheets	lb.	.27½ –	.....
Brown crepe, thin, clean	lb.	.26 –	.....
Amber crepe No. 1	lb.	.26½ –	.....

Gums

Copal, Congo, amber, bags	lb.	$0.10 –	$0.15
East Indian, bold, bags	lb.	.21 –	.22
Manila, pale, bags	lb.	.19 –	.20
Pontinak, No. 1 bags	lb.	.19 –	.20
Damar, Batavia, cases	lb.	.24½ –	.25
Singapore, No. 1, cases	lb.	.32 –	.33
Singapore, No. 2, cases	lb.	.21½ –	.22
Kauri, No. 1, cases	lb	.64 –	.66
Ordinary chips, cases	lb.	.21 –	.23
Manjak, Barbados, bags	lb.	.09 –	.14

Shellac

Shellac, orange fine, bags	lb.	$0.64 –	$0.65
Orange superfine, bags	lb.	.66 –	.67
A. C. garnet, bags	lb.	.65 –	....
Bleached, bonedry	lb.	.73 –	.74
Bleached, fresh	lb.	.60 –	....
T. N., bags	lb.	.59 –	.60

Miscellaneous Materials

Asbestos, crude No. 1, f.o.b., Quebec	sh ton	$350.00 –	$450.00
Asbestos, shingle, f.o.b., Quebec	sh. ton	$50.00 –	$60.00
Asbestos, cement, f.o.b., Quebec	sh. ton	17.00 –	20.00
Barytes, grd., white, f.o.b. mills, bbl.	net ton	15.00 –	18.00
Barytes, grd., off-color, f.o.b. Balt.	net ton	12.00 –	14.00
Barytes, floated, f.o.b. St. Louis, bbl.	net ton	24.00 –	26.00
Barytes, crude f.o.b. mines, bulk	net ton	8.00 –	10.00
Casein, bbl., tech.	lb.	.11½ –	.14½
China clay (kaolin) crude, f.o.b. Ga.	net ton	6.00 –	8.00
Washed, f.o.b. Ga.	net ton	8.00 –	9.00
Powd., f.o.b. Ga.	net ton	14.00 –	20.00
Crude f.o.b. Va.	net ton	6.00 –	8.00
Ground, f.o.b. Va.	net ton	13.00 –	19.00
Imp., lump, bulk	net ton	15.00 –	20.00
Imp., powd.	net ton	45.00 –	50.00
Feldspar, No. 1 pottery	long ton	7.00 –	8.00
No. 2 pottery	long ton	6.00 –	.....
No. 1 soap	long ton	8.50 –	.....
No. 1 Canadian, f.o.b. mill, powd.	long ton	20.00 –	.....
Graphite, Ceylon, lump, first quality, bbl.	lb.	.06 –	.06½
Ceylon, chip, bbl.	lb.	.04½ –	.07
High grade amorphous crude	ton	15.00 –	30.00
Gum arabic, amber, sorts, bags	lb.	.13½ –	.14½
Gum tragacanth, sorts, bags	lb.	.50 –	55
No. 1, bags	lb.	1.40 –	1.45
Kieselguhr, f.o.b. Cal.	ton	40.00 –	42.00
F.o.b. N. Y.	ton	50.00 –	55.00
Magnesite, crude, f.o.b. Cal.	ton	14.00 –	15.00
Pumice stone, imp., casks	lb.	.03 –	.05½
Dom., lump, bbl.	lb.	.05 –	.05½
Dom., ground, bbl.	lb.	.05½ –	.06
Silica, glass sand, f.o.b. Ind.	ton	2.00 –	2.50
Silica, sand blast, f.o.b. Ind.	ton	2.50	5.00
Silica, amorphous, 200-mesh, f.o.b. Ill.	ton	20.00 –	.....
Silica, glass sand, f.o.b. Ill.	ton	1.50 –	3.00
Soapstone, coarse, f.o.b. Vt., bags	ton	7.00 –	8.00
Talc, 200 mesh, f.o.b., Vt., bags, extra	ton	6.50 –	8.50
Talc, 200 mesh, f.o.b. Ga., bags	ton	7.00 –	9.00
Talc, 350 mesh, f.o.b. New York, grade A bags	ton	22.00 –	.....

Mineral Oils

Crude, at Wells

Pennsylvania	bbl.	$2.35 –	2.60
Corning	bbl.	1.25 –	.....
Cabell	bbl.	1.20 –	.....
Somerset	bbl.	1.15 –	.....
Illinois	bbl.	1.22 –	.....
Indiana	bbl.	1.23 –	.....
Kansas and Oklahoma, 28 deg.	bbl.	.50 –	.....
California, 35 deg. and up	bbl.	.76 –	.....

Gasoline, Etc.

Motor gasoline, steel bbls.	gal.	$0.15½ –	.....
Naphtha, V. M. & P. deod, steel bbls.	gal	.14½ –	.....
Kerosene, ref. tank wagon	gal.	.15 –	.....
Bulk, W.W. delivered, N.Y.	gal.	.09 –	.....
Lubricating oils:			
Cylinder, Penn., dark	gal.	.24 –	.....
Bloomless, 30@31 grav.	gal.	.17½ –	.....
Paraffin, pale	gal.	.16½ –	.17
Spindle, 200, pale	gal.	.21 –	.21½
Petrolatum, amber, bbls.	lb.	.03½ –	.04
Paraffine wax (see waxes)			

Refractories

Bauxite brick, 56% Al_2O_3, f.o.b. Pittsburgh	1,000	$140–145
Chrome brick, f.o.b. Eastern shipping points	ton	50–52
Chrome cement, 40-50% Cr_2O_3	ton	23–27
40-45% Cr_2O_3, sacks, f.o.b. Eastern shipping points	ton	23.00
Fireclay brick, 1st. quality, 9-in. shapes, f.o.b. Ky. wks.	1,000	42–45
2nd. quality, 9-in. shapes, f.o.b. wks.	1,000	35–38
Magnesite brick, 9-in. straight (f.o.b. wks.)	ton	65–68
9-in. arches, wedges and keys	ton	80–85
Scraps and splits	ton	85
Silica brick, 9-in. sizes, f.o.b. Chicago district	1,000	50–53
Silica brick, 9-in. sizes, f.o.b. Birmingham district	1,000	50–53
F.o.b. Mt. Union, Pa.	1,000	42–45
Silicon carbide refract. brick, 9-in.	1,000	1180.00

Ferro-Alloys

Ferrotitanium, 15-18% f.o.b. Niagara Falls, N. Y.	ton	$200.00 –	$225.00
Ferrochromium, per lb. of Cr, 1-2% C	lb.	.28 –	.30
4-6% C	lb.	.12 –	...
Ferromanganese, 78-82% Mn, Atlantic seabd. duty paid	gr. ton	110.00 –	.....
Spiegeleisen, 19-21% Mn.	gr. ton	42.00 –	45.00
Ferromolybdenum, 50-60% Mo, per lb. Mo	lb.	2.00 –	2.30
Ferrosilicon, 10-12%	gr. ton	43.00 –	50.00
50%	gr. ton	82.50 –	85.00

Ferrotungsten, 70–80%, per lb. of W	lb.	$0.88 @ $0.90
Ferro-uranium, 35-50% o U. per lb. of U	lb.	4.50 – ....
Ferrovanadium, 30-40%, per lb. of V	lb.	3.50 – 4.50

Ores and Semi-finished Products

Bauxite, dom. crushed dried, f.o.b. shipping points	ton	$5.50 – $8.75
Chrome ore, Calif. concentrates, 50% min. Cr_2O_3.	ton	22.00 – 23.00
C.i.f. Atlantic seaboard	ton	19.25 – 21.25
Coke, fdry., f.o.b. ovens	ton	5.00 – 5.50
Coke, furnace, f.o.b. ovens	ton	3.75 – 4.00
Fluorspar, gravel, f.o.b. mines' Illinois	ton	23.50 –.....
Ilmenite, 52% TiO_2	lb.	.00¾– .01
Manganese ore, 50% Mn c.i.f. Atlantic seaport	unit	.40 – .42
Manganese ore, chemical (MnO_2)	ton	75.00 – 80.00
Molybdenite, 85% MoS_2, per lb. MoS_2, N. Y.	lb.	.75 –.....
Monazite, per unit of ThO_2, c.i.f., Atl. seaport	lb.	.06 – .08
Pyrites, Span., fines, c.i.f Atl. seaport	unit	.11½– .12
Pyrites, Span., furnace size c.i.f. Atl. seaport	unit	.11½– .12
Pyrites, dom. fines, f.o.b. mines, Ga.	unit	.12 –.....
Rutile, 95% TiO_2	lb.	.10 –.....
Tungsten, scheelite, 60% WO_3 and over	unit	9.50 – 10.00
Tungsten, wolframite, 60% WO_3	unit	9.00 –.....
Uranium ore (carnotite) per lb. of U_3O_8	lb.	3.50 – 3.75
Uranium oxide, 96% per lb. U_3O_8	lb.	2.25 – 2.50
Vanadium pentoxide, 99%	lb.	12.00 – 14.00
Vanadium ore, per lb. V_2O_5	lb.	.75 – 1.00
Zircon	ton	80.00 –.....

Non-Ferrous Metals

		Cents per Lb.
Copper, electrolytic		12¼
Aluminum, 98 to 99%		26–28
Antimony, wholesale, Chinese and Japanese		9½
Nickel, 99%		27–32
Monel metal, shot and blocks		32.00
Monel metal, ingots		38.00
Monel metal, sheet bars		45.00
Tin, 5-ton lots, Straits		44 37½
Lead, New York, spot		6.85
Lead, E. St. Louis, spot		6 65
Zinc, spot, New York		6.60
Zinc, spot, E. St. Louis		6.25
Silver (commercial)	oz.	.64¼
Cadmium	lb.	.75
Bismuth (500 lb. lots)	lb.	2.55
Cobalt	lb.	3.00-3.25
Magnesium, ingots, 99%	lb.	1.25–.....
Platinum	oz.	125.00
Iridium	oz.	275.00@300.00
Palladium	oz.	83.00
Mercury	75 lb.	62.00
Tungsten	lb.	.97–1.00

Finished Metal Products

	Warehouse Price Cents per Lb.
Copper sheets, hot rolled	19.25
Copper bottoms	29.75
Copper rods	19.75
High brass wire	18.00
High brass rods	15.75
Low brass wire	20.25
Low brass rods	20.50
Brazed brass tubing	23.50
Brazed bronze tubing	27.00
Seamless copper tubing	25.50
Seamless high brass tubing	24.00

OLD METALS—The following are the dealers' purchasing prices in cents per pound:

Copper, heavy and crucible	9.00@ 9.50
Copper, heavy and wire	10.25@ 10.50
Copper, light and bottoms	8.50@ 8.75
Lead, heavy	5.50@ 5.62½
Lead, tea	3.50@ 3 75
Brass, heavy	6.00@ 6.25
Brass, light	5.25@ 5.50
No. 1 yellow brass turnings	5.75@ 6.00
Zinc scrap	3.75@ 4.00

Structural Material

The following base prices per 100 lb. are for structural shapes 3 in. by ¼ in. and larger, and plates ¼ in. and heavier, from jobbers' warehouses in the cities named:

	New York	Chicago
Structural shapes	$3.54	$3.54
Soft steel bars	3.54	3.54
Soft steel bar shapes	3.54	3.54
Soft steel bands	4.39	4.39
Plates, ¼ to 1 in. thick	3.64	64

Industrial

Financial, Construction and Manufacturing News

Construction and Operation

Alabama

BESSEMER—The Cox Foundry Co. has acquired the plant and business of the City Foundry Co. and will continue the works in operation as a separate unit. It will be devoted to the manufacture of cast-iron pipe and kindred products. Charles H. Cox will act as president and manager of both interests.

California

BURBANK—The G. M. C. Metallic Grease Co. has commenced the erection of a new plant, 45x70 ft., in the Fawkes industrial section, and will equip the structure for the production of special greases and lubricants. Mr. Lake, 915 Olive Ave., Burbank, is head.

LOS ANGELES—The Bishopic Co., manufacturer of composition board, wallboard, etc., has awarded a general contract to the W. G. Holcomb Co., 906 East 14th St., for the erection of a new 1-story plant, 150x230 ft., at South Park Ave., and 62nd St. A 1-story power house, 38x45 ft., will also be built. The plant will cost about $50,000, with equipment. Noice & Merrill, Washington Bldg., are engineers. Headquarters of the company are at Cincinnati, O.

COMPTON—The Samson Tire & Rubber Corp. has awarded a general contract to D. C. Arey, San Pedro, Los Angeles, for the erection of the proposed addition to its plant, designed to double, approximately, the present output. Foundations will be laid at once. Adolph Schleicher is president.

SACRAMENTO—W. P. Fuller & Co., Mission and Beale Sts., San Francisco, manufacturer of paints, oils, etc., has tentative plans under advisement for the rebuilding of its branch at Sacramento, partially destroyed by fire, Nov. 10, with loss approximating $150,000, including equipment and stock.

GILROY—C. T. Bolfing, formerly secretary of the local Chamber of Commerce, has tentative plans under way for the construction of a new plant near the city limits, for the manufacture of vitrified clay products. It is expected to cost in excess of $25,000.

Connecticut

MANCHESTER—The Rogers Paper Mfg. Co. has commenced improvements at its mill on Charter Oak Ave., including mechanical drying department, circulating system, and other work. The J. O. Ross Engineering Corp., 30 East 42nd St., New York, will be in charge of the machinery installation.

Florida

EUSTIS—The Florida Citrus Process Co., recently organized, is planning for the construction of a byproducts plant for the production of oils, vinegar, etc., in connection with a new citrus fruit extract plant, estimated to cost about $85,000, with equipment. A. P. Fothergill is vice-president and general manager.

Illinois

CHICAGO—The Meyercord Co., 5339 West Lake St., manufacturer of paper decalmonia transfers, etc., has awarded a contract to E. G. Bear, 19 South La Salle St., for the erection of a 3-story addition, 110x155 ft., estimated to cost $200,000, with machinery. J. Floto, 53 West Jackson Blvd., is architect.

CHICAGO—The Western Bag & Paper Co., 521 West 63rd St., will commence the erection of a new 2-story plant addition, 60x100 ft., at 64th St. and Wentworth Ave., to cost about $50,000.

CHICAGO—The Fleishmann Co., 111 West Jackson Blvd., manufacturer of yeast, etc., has filed plans for the erection of 2- and 3-story addition, 33x76 ft., to be equipped for mechanical drying and other service, estimated to cost $43,000.

Indiana

DUNKIRK—The Indiana Glass Co. has tentative plans under consideration for the erection of a new plant on local site, to cost in excess of $125,000, including equipment. Frank Murray is president.

TERRE HAUTE—The Wabash Valley Refining Co. will commence the construction of the initial unit of its proposed local plant, on site of the former works of the Ball Brothers Glass Co. It will be equipped primarily for compounding for the production of lubricating oils, and is estimated to cost $25,000.

ELWOOD—The American Sheet & Tinplate Co. has preliminary plans under advisement for the construction of a new addition to its mill.

Kentucky

LOUISVILLE—Richard D. Barrow & Son have purchased property at Hill and 14th Sts., including factory and land, and plan to remodel, improve and equip the structure for the manufacture of rubber specialties for domestic and other service. Richard D. Barrow is head.

Maryland

BALTIMORE—The Standard Sanitary Mfg. Co., Bessemer Bldg., Pittsburgh, Pa., manufacturer of enameled iron sanitary ware, vitreous china products, etc., will take bids at once for the erection of its proposed local plant at 5th Ave., and 17th St., Canton section, to consist of a number of units, with power house, estimated to cost approximately $3,000,000, with machinery. Samuel Diescher & Son, Farmers' Bank Bldg., Pittsburgh, are engineers. Theodore Ahrens is president.

Michigan

PORT HURON—The Dunn Sulphite & Paper Co., Detroit, has plans in preparation for the construction of its proposed new local mill on the St. Clair River, comprising several acres of land recently acquired for this purpose. It will consist of a number of units, with power house, estimated to cost approximately $500,000. Theodore Dunn is president.

THREE RIVERS—The Eddy Paper Co. has acquired a tract of property adjoining its local No. 1 and No. 3 mills, providing additional reserve of about 23 acres for proposed future expansion. The preparation of plans will be deferred until a later date.

HOUGHTON—The Michigan College of Mines has awarded a general contract to Herman Gundlach, Houghton, for the construction of a 3-story and basement metallurgical and ore-dressing building, to replace a structure recently destroyed by fire. Lynn W. Fry, Ann Arbor, Mich., is architect.

DETROIT—The Detroit Rock Salt Co. has commenced the sinking of a new shaft at its mines at Oakwood, and will provide equipment for extensive increased production. It is purposed to extend to a depth of 1,168 ft.

Missouri

KANSAS CITY—The Dean Rubber Co., 14 Chestnut St., will take bids early in February for the construction of its proposed local plant for the manufacture of rubber specialties, estimated to cost about $45,000. At the same time bids will be called for equipment. W. J. Dean, 561 Grand Ave., heads the company.

ST. LOUIS—The Warren Steel Casting Co., 3400 Maury Ave., has revised plans in preparation for the erection of its proposed 1-story foundry at the Kingshighway and Fairview Ave., estimated to cost $65,000, and will take bids at an early date. Oliver J. Popp, Odd Fellows Building, is architect.

New Jersey

NEWARK—The Slickshine Polish Co. has leased the building at 87 Pennington St., for the establishment of a new plant for the manufacture of polishes and kindred products.

JERSEY CITY—The Baker Paint & Varnish Co., 228 Suydam Ave., has filed plans for the erection of two new 1-story plant buildings at 114 Halladay St., to cost about $18,000, exclusive of equipment. Work will be commenced at once.

HOBOKEN—The Hottopp Varnish Co., 110 Marshall St., will make alterations and extensions in its plant to cost about $14,000.

New York

LOCKPORT—The Vera Chemical Co. has plans for the construction of a new plant on the Stevens property, to be equipped for the manufacture of gloss oils and kindred products. A large tankage department will also be installed. Work will be commenced at once.

OAKFIELD—The United States Gypsum Co. has commenced the erection of a new addition to its local plant, 46x600 ft., to be used for the manufacture of gypsum wallboard and other gypsum specialties. Headquarters of the company are at 205 West Monroe St., Chicago, Ill.

BROOKLYN—The Chester Glass Co., 143 Gratten St., has plans in preparation for the erection of a 1-story addition to its plant, 50x100 ft. Improvements will also be made in the present works. Harry A. Yarish, 29 Graham Ave., is architect.

BROOKLYN—Kirkman & Son, 215 Water St., manufacturers of soap products, have purchased the former foundry of the E. W. Bliss Co., Plymouth St., in the vicinity of its works, and plan to remodel and improve the structure for an addition. The property totals 100x137 ft.

BUFFALO—Fire, Nov. 10, caused by an explosion, damaged a portion of the plant of the National Aniline & Chemical Co., Abbott Rd. and Lee St., with loss estimated at $17,000. It is planned to rebuild at once.

Ohio

ST. BERNARD—The Cincinnati Chemical Co., Norwood, O., is taking bids for the erection of a new addition to its local plant on Murray Rd. The present factory will also be remodeled and improved. Tietig & Lee, Fourth National Bank Bldg., Cincinnati, O., are architects. G. F. Handel is president.

ZANESVILLE—The Fraunfelter China Co., recently formed under Maine laws, has acquired the local plant of the Ohio Pottery Co., as well as the pottery of the American China Co., Chesterton, Ind., for a total consideration said to be in excess of $1,200,000. The new owner will maintain headquarters at the Zanesville works, and plans for extensive operations at both plants, including a number of improvements. Employment will be given to about 500 operatives. M. F. Foster is president.

SANDUSKY—The Erie Rubber Corp. has been organized under state laws to acquire the plant of the Erie Tire & Rubber Co., on local site, which will be offered at a receiver's sale on Nov. 28. It is expected to take early possession and make necessary improvements for full operation. The new company is headed by Judge E. B. King and H. R. Greenlee, both of Sandusky, the latter now acting as receiver for the Erie Tire Company.

TIFFIN—The Standard Sanitary Mfg. Co., Bessemer Bldg., Pittsburgh, Pa., manufacturer of sanitary enameled iron ware, etc., has awarded a contract to G. E. Dennis, Spayth Block, Tiffin, for the erection of a new local pottery, 140x140 ft., to cost about $150,000, including equipment. G. W. Netcher, Tiffin, is architect.

Pennsylvania

WALNUTPORT—The American Nickleloid Co., Peru, Ind., manufacturer of quicksilver plating for mirrors, and other plating specialties, has awarded a general contract to the Austin Co., Atlantic Bldg., Philadelphia, Pa., for the erection of a new branch plant at Walnutport. It will be 1-story, 70x100 ft., and estimated to cost $25,000.

PHILADELPHIA—The Gulf Refining Co., Widener Bldg., has completed plans and will commence the erection of a 5-story oil storage and distributing plant at 32nd and Penrose Sts., to cost about $300,000.

DANVILLE—The Danville Galvanizing Co. is completing the establishment of a new local plant for steel galvanizing work, and will commence operations at an early date. Irvin Vannan, Jr., and Robert Moffett head the company.

Tennessee

MEMPHIS—The Plough Chemical Co. has tentative plans under advisement for the construction of a new local plant and laboratory to cost about $500,000, including equipment. It is expected to have plans and details arranged early in the coming year. Abraham Plough heads the company.

Texas

FORT WORTH—The Transcontinental Oil Co. has work in progress on a new local plant unit to be equipped for the production of lubricating oils, waxes and kindred specialties. The company is completing a new gasoline refinery at the works, to provide for extensive increase in output. The expansion will cost about $1,300,000, including equipment.

BRECKENRIDGE—The Hanlon Gasoline Co., operated by the Chestnutt & Smith Corp., Tulsa, Okla., has preliminary plans under way for the construction of a new gasoline-refining plant on site about 2 miles from the city, with initial capacity of 50,000 gal. per day, designed as one of the largest such plants in the country. The company will also make enlargements in its local refining plant, including the installation of additional equipment, the entire expansion being estimated to cost $2,000,000, with machinery. Purchase has been made of the local property of the Hi-Power Gasoline Co. including two refineries. One of these will be enlarged and improved, and the other dismantled and removed to the Hanlon refining plant in the city.

Washington

SEATTLE—The Duralite Co., Central Bldg., recently organized to manufacture a special composition building material, formed of purified magnesite, dolamite, quartz, silica sand and other products, has plans under way for the construction of a new local plant, estimated to cost about $50,000. Harry Shaw is president.

West Virginia

DUNBAR—The Carrier Chemical Co., recently organized, has acquired a tract of about 7 acres of land near Dunbar, and plans for the immediate erection of a new plant, estimated to cost about $50,000, including equipment. The new company is headed by M. T. Davis, Jr., president, and C. F. Carrier, vice-president and general manager.

New Companies

COLUMBIA GLASS CO., Los Angeles, Calif.; glass products; $250,000. Incorporators: George W. Elmers and Walter E. Smith, both of Los Angeles.

EXPLOSIVE CHEMICAL CO., New York; chemical products; nominal capital $5,000. Incorporators: S. Okin and Y. Haspel. Representative: Benjamin Machinist, 277 Broadway, New York.

CHICAGO SMELTING & REFINING CO., 2457 South Loomis St., Chicago, Ill.; refined metals; $100,000. Incorporators: Hyman Feinberg and Arthur P. Regal.

CROWN CHEMICAL CORP., 59 Washington St., Newark, N. J.; chemicals and chemical byproducts; $50,000. Incorporators: Richard Townsend, DuBois Beale and Alvin Ahlesen.

KAYSER TANNING CO., St. Louis, Mo.; leather products; $50,000. Incorporators: F. L. Kayser and A. E. Leusler, both of St. Louis.

AMESBURY BRASS & FOUNDRY CO., Amesbury, Mass.; brass and bronze castings; $150,000. Incorporators: Robert H. Hills (president), and William E. Biddle, Amesbury, (treasurer). The last noted is representative.

SHOEMAKER & BUSCH, INC., Philadelphia, Pa., being organized; chemicals and compounds, etc. Application for state charter will be made Dec. 3. Incorporators: Miers and Henry P. Busch, and Hiram K. Hineline. Representative: James C. Jones, Bullitt Bldg., Philadelphia.

PAN-AMERICAN SOUTHERN PETROLEUM CO., Wilmington, Del.; petroleum products; $100,000. Representative: Corporation Trust Co. of America, du Pont Bldg., Wilmington.

KELLEY COLOR LABORATORY, INC., Jersey City, N. J.; chemical products, colors, etc.; $100,000. Incorporators: William V. and George P. Kelley, and Frederick N. Esher, 587 Summit Ave., Jersey City. The last noted is representative.

LINCOLN PRODUCTS CO., Portland, Me.; paints, oils, varnishes, etc.; $10,000. Theodore B. Forbes is president; Lester F. Wallace, treasurer; and Leon M. Forbes, representative, all of Portland.

INDIANA PAPER CO., Indianapolis, Ind.; paper products; $125,000. Incorporators: Fred J., Elmer H., and Harry C. Ostermeyer, all of Indianapolis.

SIERRA PETROLEUM CO., Los Angeles, Calif.; refined oil products; $100,000. Incorporators: W. W. Bradley, M. J. Gentry and John Griffen. Representative: Joseph Crail, Bartlett Bldg., Los Angeles.

B. & H. NOVELTY CO., 274 South Orange Ave., Newark, N. J.; organized; to manufacture celluloid and other composition products. Aaron Berkowitz heads the company.

ALLOY REDUCTION CO., INC., Wilmington, Del.; metal alloys; $3,000,000. Representative: Corporation Trust Co. of America, du Pont Bldg., Wilmington.

MARATHON CONCRETE WORKS, INC., Marathon, Wis.; concrete and cement blocks and kindred products; nominal capital $5,000. Incorporators: C. Kerstein and A. Buman, both of Marathon.

PRIEST PRAIDS FERTILIZER CO., Augusta, Me.; fertilizer products; 1,000 shares of stock, no par value. E. M. Leavitt is president; E. F. Porter, treasurer; and Ernest L. McLean, representative, all of Augusta.

ONTONAGON FIBRE CO., Ontonagon, Mich.; fiber products; $300,000. Incorporators: Cyrus C. Yawkey, David C. Everest and Benjamin F. Wilson, all of Wausau, Wis.

CORDOVA RUBBER CO., Pittsburgh, Pa.; rubber products; nominal $5,000; Philip L. Drosnes, 160 Luna St., Pittsburgh, treasurer.

ACME PAPER BOARD CO., Wilmington, Del.; paperboard products; $2,100,000. Representative: Corporation Service Co., Equitable Bldg., Wilmington.

EAST INDIAN CHEMICAL CO., New York; chemicals and chemical byproducts; $100,000. Incorporators: J. S. Doyle, G. W. Vause and W. Baxter. Representative: H. P. Freece, 35 Wall St., New York.

WILLIAM J. CRAWFORD OIL CO., Pittsburgh, Pa.; oil products; $15,000. Robert P. Crawford, 9 Wood St., Pittsburgh, is treasurer.

UNITY CHEMICAL CO., New York; chemicals and chemical byproducts; $20,000. Incorporators: A. Sternberg and R. J. Halpern. Representative: L. Lindauer, 186 Joralemon St., Brooklyn, N. Y

INDIAN OIL CO., Charleston, W. Va.; refined oil products; $100,000. Incorporators: W. J. Wharton, Belpre, O.; C. L. Bowling, Lester, W. Va.; and Guy D. French, Ceredo, W. Va.

PARAMOUNT MFG. CORP., Easton, Pa.; refined oil products; $100,000. Incorporators: L. M. Elliott and John R. Welsh, Easton; and Edwin Y. Bates, Phillipsburg, N. J. Representative: Colonial Charter Co., Ford Bldg., Wilmington, Del.

Industrial Notes

THE BRIDGEPORT BRASS CO., Bridgeport, Conn., announces the appointment of E. E. Helm as district manager at Detroit. Mr. Helm comes from Akron, Ohio, where for 2 years he was manager of the industrial bureau of the Akron Chamber of Commerce.

THE UNITED STATES CAST IRON PIPE & FOUNDRY CO. announces the appointment of Thomas P. Anthony as chief engineer of the company, with offices at Burlington, N. J. P. T. Laws has been appointed Southern district manager of the company, with offices at 1002 American Trust & Savings Bank Bldg., Birmingham, Ala.

FRANK H. SCHUBERT, district manager of the Wheeler Condenser & Engineering Co., and William G. Christy, secretary of the St. Louis Section of the American Society of Mechanical Engineers and formerly with the St. Louis Boat & Engineering Co., announce the organization of the Schubert-Christy Construction & Machinery Co., with offices in the Railway Exchange Bldg., St. Louis, Mo.

Opportunities in the Foreign Trade

Parties interested in any of the following opportunities may obtain all available information from the Bureau of Foreign and Domestic Commerce at Washington or from any district office of the bureau. The number placed after the opportunity must be given for the purpose of identification.

CHEMICAL PRODUCTS and colors for manufacture of ceramics. Oporto, Portugal. Purchase.—8183.

DRY COLORS, particularly black. Valparaiso, Chile. Purchase.—8207.

METHYLATED SPIRITS, benzine, toluene, and pure benzine. Zurich, Switzerland. Purchase.—8180.

PAINTS, cheap bitumastic, dark green, for wagons. Bombay, India. Purchase.—8192.

PERFUMES, soaps, cosmetics, and other toilet articles. Riga, Latvia. Purchase and agency.—8135.

ROSIN, gum and wood, and turpentine. Prague, Czechoslovakia. Purchase.—8169.

GRAPHITE, best quality, 20 tons. Budejovice, Czechoslovakia. Purchase.—8136.